RAILROAD GAZETTE

FRIDAY, FEB. 27.

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Contributions.

The Brooklyn Bridge Railroad.

READING, PA., Feb. 19, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In *Engineering News* of Feb. 14 I note the article of "Dot" on the Brooklyn Bridge question, reprinted from your columns, together with Mr. Wellington's remarks on same and his alleged demonstration of its futility, as also that of Mr. G. Leverich's plans. Mr. Wellington justly states that the latter's plan proposes a physical impossibility, although he does not succeed as well as possibly he would desire in specifically demonstrating this fact to the unbiased mind of the critic.

With regard to the schedule of "Dot," Mr. Wellington makes a woeful blunder in imagining that there is any possibility, let alone a certainty, of collision, as he cannot fail to realize after consulting the following schedule of events:

Time seconds.
0—B_1 arrives from bridge.
20—A_1 " " "
30—B_1 pulls for crossing.
50—A_1 " " switch.
60—B_1 clears crossing (arrives on switch) and begins to back for loading platform.
80—A_1 arrives on switch and begins to back for crossing.
90—B_2 arrives from bridge.
90—B_1 finishes "kicking" back train.
110—A_2 arrives from bridge.
110—A_1 finishes "kicking" back train over crossing.
120—B_2 pulls for crossing.
140—A_2 " " switch.

This shows, as "Dot" states, that the B engine has about 15 seconds to wait before the crossing is free, and then 15 seconds to run over and couple on to B_2. "Dot's" plan is practicable, but appears to be open to the objection that the time of switching out and "kicking" back is reduced to a limit hitherto unwarranted by experience.

However, granting that it were *possible* to reduce the time of these operations to 30 seconds, a perfectly safe and practical schedule can easily be arranged for a headway of 35 seconds. With the Barnes-Martin plan of double tail switching the *minimum* headway between trains depends solely on three circumstances—time of switching out, time of kicking back and time required for engine to return and couple on—and is independent of the time of lying at the platforms, provided that time be less than the headway of trains. Obviously the most economical plan for time is that the B and A trains switch in pairs, departing for switch and "kicking" back simultaneously, both engines returning and coupling on together. To accomplish this "Dot's" plan, of running the trains in pairs with just sufficient headway between to allow train No. 2 to be switched from the main bridge track to the A track, must be utilized, and also Mr. Leverich's idea of unequal times of waiting at the platforms.

Mr. Leverich's observations at the present bridge terminal demonstrate that the following schedule is practically attainable, with an ample margin for irregularities, which schedule nevertheless permits of a headway of 45 seconds. B trains wait 60 seconds at incoming and 40 seconds at outgoing platforms, and A trains the reverse; time of switching out, 45 seconds; time of "kicking" back, 35 seconds; to return and couple, 10 seconds; trains run in pairs, A train 20 seconds back of B train, and followed by the B train of next pair with headway of 70 seconds. The following chronological schedule shows the entire sequence clearly:

Time, seconds.
0—B_1 arrives from bridge.
20—A_1 " " "
60—B_1 pulls for crossing.
60—A_1 " " switch.
90—B_2 arrives from bridge.
105—B_1 arrives on switch.
105—A_1 " " "
110—A_2 " from bridge.
140—B_1 " at loading platform.
140—A_1 " " " " and clears crossing.
150—B_2 pulls for crossing.
150—A_2 " " switch.
180—B_1 leaves for bridge.
180—B_2 arrives from bridge.
195—B_2 arrives on switch.
195—A " " "
200—A leaves for bridge.
200—A arrives from " Etc., etc.

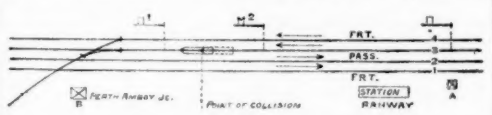
In this case the motions of both trains being simultaneous, they move in *parallel* lines, thus practically doing away with any possibility of collision. After engines B and A finish "kicking" B_1 and A_1 at sec. 140, they return together, B over crossing and A over stub, couple on to B_2 and A_2, and pull out at second 150, and repeat the operation of trains Nos. 1 and 2. S. W. FRESCOLN.

[But A_2 is due to leave the switch five seconds before A_1 is due to leave the loading platform. Again, time is wasted to get an absolute parallel movement, which has no advantage if the interlocking is complete.—EDITOR RAILROAD GAZETTE.]

Two Collisions Under the Block System.

On the 16th a collision occurred on the Pennsylvania Railroad near Rahway, N. J. A passenger train ran into the tail of a freight train standing on the passenger track. The caboose and five cars of the freight train were thoroughly wrecked, as well as the engine of the passenger train, and the engineer and fireman were seriously injured. The express car, which was next to the engine of the passenger train, was telescoped by the tender and the express messenger was injured. So far as we can gather, the facts concerning this accident were as follows:

The collision occurred about 5 a. m., in a wind and rain storm. Both trains were westbound, the freight preceding the passenger. When the freight arrived at signal tower A, just east of the Rahway station, the signalman



thought it was running on the freight track No. 4, and so informed the signalman at B by Morse telegraph. It was, in fact, however, on track 3, and proceeded toward B on that track, that section having previously been telegraphed by bell as clear and the signal showing all clear. When about half way through the section A B, which is about 1¼ miles long, the train parted. After the rear part had been stopped the engine stopped and backed up to make coupling. The signalman at B thought that the train was, as signaled, on the freight track, and was waiting to cross over, and telegraphed "Line Clear" to A in response to notification from A of the approach of a train on the passenger track. This he was warranted in doing, because the previous train was signaled as on the freight track. Signalman B then lowered home and distant signals 1 and 2 for the approaching passenger, which was one of the fast newspaper trains. The engineman of the passenger seems not to have seen the tail lights of the freight, and went ahead at full speed under the authority of the clear distant signal, and collided with the standing freight train at the point indicated in the sketch. The rear brakeman of the freight has not been seen since the accident, and it is therefore probable that he failed to go back.

THE COLLISION IN THE FOURTH AVENUE TUNNEL.

On the morning of Feb. 20, at about 7:06, a rear collision of north-bound trains a few rods south of the Eighty-sixth street station in the Fourth avenue tunnel, two miles north of the Grand Central Station, New York City, caused the death of 6 and the injury of 7 employés of the New York Central and the New York, New Haven & Hartford railroads. The circumstances of the collision were as follows: The two night express trains from Boston arrived at the Grand Central Station at their usual times. After being emptied they were coupled together and a yard engine and crew at 6:55 started with them back to the Mott Haven yard (five miles), where most of the passenger cars of through trains are laid up and cleaned. This train, being heavy, moved at a low rate of speed, and before it reached the Eighty-sixth street block station passenger train No. 10, an accommodation of the New York, New Haven & Hartford, which left the terminal at 7.02, reached the entrance of the block which the empty train then occupied. This block extends from Seventy-second street to Eighty-sixth street, about three-quarters of a mile. The New Haven train passed the distant and home signals at Seventy second street at about 30 miles an hour, and crashed into the rear of the preceding train at the point above indicated. The empty train was then moving about eight miles an hour, the grade being heavy. Its rear car was a Boston & Albany smoking car, and the next was a Boston & Albany day car. In front of these were a number of sleeping cars. The New Haven engine penetrated the smoker but a few feet, and was itself but little damaged, the loss of the smoke-stack, head light and cow-catcher being about all. The smoker and the next car were, however, telescoped for several feet.

It was here that the occupants of the cars were riding, and most of them were badly mangled. Fire immediately broke out, probably from the heater in one of the cars, and the wreck was, in a very short time, enveloped in flames. The uninjured persons on the New Haven train at once went to the rescue of the sufferers, but they were soon driven away by the heat and by molten metal falling from the roofs of the cars and could do but little. It is possible that some of those who were burned might have been rescued alive but for the fire, though there is no clear evidence on the point. One or two of the corpses were almost unrecognizable. The collision occurred at a point where the openings in the roof of the tunnel are very large and the ascending smoke at once attracted the attention of citizens and policemen, and the fire department was soon called; and the flames, after considerable difficulty, were extinguished. All the victims on the empty train were employés or quasi-employés. One woman and two men were car cleaners (the cleaners ride back and forth on the empty cars between the station and the yard frequently in the course of their work); a machinist and a fireman were going to their work and a boy was going to carry his father's breakfast. Of the injured, one was an engineer, two brakemen and two employés going to their work. The engineer and conductor of the New Haven train were slightly injured and two or three passengers were also somewhat hurt.

A moment after the collision occurred a southbound yard engine ran into the wreck, which fouled both tracks, and was derailed, but the six men on it escaped uninjured.

The piece of road in question is owned by the New York & Harlem, which is leased to the New York Central & Hudson River; and this section is operated as the "Harlem Line," which, with the Grand Central Station, is an organization in which the New York, New Haven & Hartford has a share. Mr. C. H. Platt, the General Manager of the Grand Central Station, was soon on the scene, and made a careful examination of the situation. The signalman at Eighty-sixth street said that at the time the collision occurred he had not unlocked the Seventy-second street signal. The operator at the latter station said that his home signal was at danger and his distant signal at caution, and that he, immediately on the passage of the New Haven train, notified Eighty-sixth street that the train had passed without authority. The Eighty-sixth street man immediately shouted to the engineer of the empty train to go ahead faster; the collision had, however, already occurred, though unknown to him and to the men on the forward portion of the empty train, and the brakes had been automatically applied by the rupture of the train pipe at the rear. The statement of the Seventy-second street operator is corroborated by a track walker who was in the cabin when the New Haven train passed. Mr. Platt also saw the section master, who was close to the distant signal when the New Haven train passed it, and he says that it showed green (caution).

The engineer of the New Haven train, Louis Fowler, says that as he entered the tunnel (Fifty-ninth street he warned his fireman to keep a close watch for the signals, and that the latter on passing the distant and home signals at Seventy-second street told him that they were all clear. From his testimony at the coroner's inquest on Tuesday he apparently claims to have personally seen the distant but not the home signal. The northbound trains here run on the left-hand track, and the signals are located on the left side of the track. They consist of ordinary signal lamps presenting a face about 8 × 15 in., placed on vertical iron rods which are turned a quarter turn to change the signal from "safety" to "danger," and *vice versa*. The bull's-eyes are large, and the surrounding surface is painted to correspond with the color of the glass. The home signals are about even with the tops of the cab windows and the distant signals are about 4 ft. above the rail. The view in the tunnel and cut is obscured by smoke and steam after the passage of each train, and the lamps are kept constantly lighted. There is at each home signal a gong as described in the article in another column.

A coroner's jury is investigating the case, and the New York State Railroad Commissioners will take up the matter March 6. Engineer Fowler and William McManus, operator at Seventy-second street, have been arrested and held in $10,000 bail to await the result of the coroner's inquest.

Best Diameter of Car Wheels.*

It goes almost without saying that for any given service we want the best car wheel, and in general it is evident that this is the one best adapted to the efficient, safe and prompt movement of trains, to the necessary limitations improved by details of construction, and also the one most economical in maintenance and manufacture.

It is our aim this afternoon to look into this question in so far as the diameter of the wheel affects it, and in doing it we must consider what liability there is to breakage or derangement of the parts of the wheel, hot journals, bent axles, the effect of the weight of the wheel itself, and the effect upon the track and riding of the car, handling in the shop, the first cost of repairs, the mileage, methods of manufacture, the service for which the wheel is intended, and the material of which it is made.

Confining ourselves to freight and passenger service, and to cast iron and steel wheels in the general acceptation of the term as being the most interesting, we know that cast iron is not as stong as wrought iron or steel, that the tendency of a rotating wheel to burst is directly proportional to its diameter, and that the difficulty of making a suitable and perfect casting increases with the diameter. Cast iron, therefore, would receive no attention if it were not for its far greater cheapness as compared to wrought iron or steel. This fact makes its use either

* By Samuel Porcher, Assistant Engineer Motive Power Department Pennsylvania Railroad. Read at a regular meeting of the New York Railroad Club, Feb. 19, 1891.

wholly or in part very desirable for freight service, and even causes some roads in this country, notably the one with which I am connected, to find it profitable to develop and perfect the cast-iron wheel for use in all but special cases.

Steel, on the other hand, notwithstanding its great cost, is coming more and more into favor, and has the great recommendations of strength and safety. It is also of such a nature that wheels tired with it run much further before being unfit for further service than those made of cast iron, and consequently renewals are less frequent. The inference would seem to be that a combination of steel and cast iron would effect the desirable safeness with the greatest cheapness; but up to the present this state of affairs has not been realized to the proper extent, because of the labor and cost necessary to accomplish this combination and the weakness involved in the manner of joining the two kinds of material together.

Taking up the consideration of the diameter of the wheel now, and allowing that on the score of economy cast iron must be used for wheels in freight service, we are led to reflect that here heavy loads are carried, and there is a growing tendency to increase them by letting the floor of the car down to a level with the draft timbers. All this makes it desirable to have the wheels strong and small to avoid bent axles and broken flanges, to enable us to build a strong truck, to reduce the dead weight of the cars to a minimum, and have wrecks quickly cleared away. The time has not yet come when we have to consider seriously hot journals arising from high speed on freight trains, and a reasonable degree only of easy riding is required. The effect on the track is, however, a matter of moment. Judging from the above, I should say that no wheel larger than one 33 in. in diameter should be used under freight cars. Since experience in passenger service shows that larger cast-iron wheels do not make greater mileage and cost more per 1,000 miles run, and that cast-iron wheels smaller than 33 in., while sometimes costing less per 1,000 miles run, are more troublesome in the end, it is apparent that 33 in. is the best diameter for the wheels we have to use in freight service.

When we take up passenger service we come to a much more difficult and interesting part of the subject, for here we must consider it in all its bearings, and meet the complications that varying conditions of place and service impose. In consequence, I do not believe we can recommend one diameter for all passenger car wheels, although such a state of simplicity would be most desirable. For instance, in a sandy country where competition is active, and consequently speed is high and maintained for a length of time without interruption, I would scarcely hesitate to recommend the use of cast iron for car wheels, because steel will wear out so rapidly in such a place that its use will be unsatisfactory. If then cast iron is used we will find that we can not make with it as large a wheel as we may determine is desirable when steel is used. And just to follow this line out to its close I will state here that we find that 36 in. seems to be the maximum satisfactory diameter for cast iron wheels, because this size does not give greater mileage than 33-in., costs more per 1,000 miles run, and seems to be nearer the limit for good foundry results. On the other hand, a 36-in. wheel rides well and gives immunity from hot boxes, a most fruitful source of annoyance in sandy districts. It is also easily applicable where all modern appliances under the car are found, including good brake rigging. In all passenger service, then I would recommend 36-in. as the best diameter for cast iron wheels.

Next taking up steel wheels, a great deal might be said about the different makes and patterns, but as the diameter of wheels of this kind is not limited practically to any extent by the methods of manufacture except as to the fastening of the wheel and tire together, we will note this point only. Tires might be so deeply cut into for the introduction of a retaining ring that a small wheel would be unduly weakened after a few turnings. On the other hand, when centres and tires are held together by springing the former into the latter under pressure, it is possible that a tire of larger diameter might be over-strained. But allowing that the method of manufacture does not limit the diameter of a steel wheel as it does a cast-iron one, the claim that the largest diameter is the best is open to debate at least, and, I believe, proof to the contrary on several accounts. It is argued that increasing the diameter of a wheel increases its total mileage in proportion, or even more. Whether this be so or not, there are two other very objectionable features that come with an increase in diameter—the wheel becomes more costly and weighs more, without giving in all cases a proportionate return. We have to do more work in starting and stopping and in lifting the large wheel over the hills, and when the diameter exceeds a certain figure we have to pay more per 1,000 miles run. I am very firmly convinced that the matter of dead weight should receive more attention than it does, with a view to reducing it. The weight of six pair of 42-in. wheels and axles alone is 15,000 to 16,000 lbs.

The matter of brakes is coming up for more attention in these days of high speeds, heavy cars and crowded roads, and the total available braking power which has hitherto been but partially taken advantage of must be fully utilized. I refer to the fact that many of our wheels in six-wheel trucks have gone unbraked where they should not. And as the height of cars and length of trucks cannot well be increased for obvious reasons, it is necessary to keep the size of the wheels within the limit that will enable us to get efficient brakes on all of them that carry any weight. This is not easy with a 42-in. wheel in a six-wheel truck, which is usually the kind that requires most adjustment and repairs after long runs. The Pullman Company has recognized this fact and is now replacing its 42-in. wheels with ones 38 in. in diameter.

A 42-in. wheel with 4-in. journal has a greater leverage wherewith to overcome the resistance of journal friction than the 38-in. wheel with the same journal, and even more than the 36-in. and 33-in. wheels with 3¾ in. and 3½ in. journals respectively, but the fact remains that the same amount of work has to be done in overcoming the friction in each case, and what may be gained in ease of starting with the large wheel is lost in time necessary to do it, and in the extra weight put into motion.

A large wheel increases the liability to bent axles in curving on account of greater leverage unless the size and weight of the axle are increased to correspond, and the wheel itself must be made stronger. A four or six wheel truck will not retain its squareness and dependent good riding qualities so well with 42 in. wheels as with 33-in. ones. Besides the brakes, the pipes for air and steam under the cars interfere with large wheels, and as a consequence of all this 42 in. wheels have been replaced by 33-in. ones to some extent in some places with satisfactory results. On one road in particular so strong is the inclination away from large wheels that 30-in. is advocated as the proper size for passenger cars.

On the other hand, there is no doubt a car wheel may be too small, for the tires of small wheels probably do not get as much working up under the rolls, and therefore are not as tough or homogeneous. Small wheels are more destructive to frogs and rail joints. They revolve faster at a given speed, and, when below a certain size, increase the liability to hot journals if carrying the weight they can bear without detriment to the rest of the wheel. Speed alone I am not willing to admit is the most prolific source of hot boxes. The weight per square inch upon the bearing is a very important factor. I have found by careful examination in a great many cases that the number of hot-boxes bears a close relation to the weight per square inch on the journal and the character of lubrication, and is not so much affected by the size of wheel or speed. These observations were made upon 42-in., 36-in. and 33-in. wheels in the same trains. We find, furthermore, that while a 3⅝-in. journal on a 33-in. wheel is apt to heat under our passenger coaches, a 3¾-in., or when worn 3⅝-in., journal on a 36-in. wheel runs uniformly cool. In 1890 on one division there were about 180 hot-boxes with the small wheel, against 29 with the larger one, with a preponderance of the latter size in service and cars of the same weight over them.

I do not know that there is any more tendency for a large wheel to slide than a small one under the action of the brakes, but large wheels wear out more brake shoes than small ones, if there is any difference in this particular.

My conclusions are that 42 in. is too large a diameter for steel wheels in ordinary passenger service, and that 36 in. is right. But as steel-tired wheels usually become 3 in. smaller in diameter before wearing out, the wheel should be about 38 in. in diameter when new. Such a wheel can be easily put under all passenger cars, and will not have become too small when worn out. A great many roads are using 36-in. wheels, but when their tires have lost 3 in. diameter they have become 33-in. wheels, which I think too small.

There are many things I have left unsaid, and I am aware that some of the members of the club have had most satisfactory service with 42-in. wheels so far as exemption from all trouble is concerned, and others have never seen any reason for departing from the most used size of 33 in.

One more word about lightness. A wrought iron or cast steel centre, with 8 or 9 light spokes and a light rim inside a good steel tire makes the lightest wheel, and one that ought to be in this country, as it is elsewhere, the cheapest not made of cast iron.

DISCUSSION.

Mr. Blackall: The gentleman has been speaking about the weight on the journals producing friction and heat. I would like to know the amount of pressure per square inch of surface that he would recommend.

Mr. Porcher: It ought not to be more than about 240 lbs., that is, on wheels that run as ours do. We run a good many trains 70 miles an hour, without stopping, for considerable distances. Two hundred and forty pounds, taking a great many cases, is about a safe limit for a wheel of 36 in. in size.

Mr. Blackall: It is important that we should know more about the pressure on the journal per square inch; I think it is an important factor in hot journals, more so than the speed. Seven thousand pounds on a journal is about all we can go at high speed. We are safe not to go beyond 9,000 lbs.; if we go beyond that, we have trouble.

Mr. Porcher: I would like to ask for information something more about steel wheels We have only cast-iron wheels on the Pennsylvania Railroad.

Mr. Adams (B. & A.): We have used steel wheels on the Boston & Albany road for 20 years at least, almost entirely under our passenger equipment and engines. I presume most of you have seen the statements of mileage made; that is, between 400,000 and 500,000, and up to 550,000 miles for 33-in. wheels. The average mileage of 33-in. wheels, worn out from all causes, is about 300,000 miles. That is just about as the average stands at the present time, and something like 50 or 55 per cent. of those wheels that were condemned for passenger service were put under freight, and are still running under freight cars. We have quite a number of varieties. We have what are termed with us the Washburn wheel. That was almost entirely used by us for quite a length of time, but for the last 8 or 10 years we have used the Allen wheel and an English wheel; we have a good many wrought iron English wheels, wrought iron centres, 500 or 600, and later on we had the Snow wheel and the Boice wheel. We have 16 of Fowler's patent rolled wheel that have done very fair service, although nothing like what I expected from them.

I find, by careful records, that the 42-in. wheel as compared with the 33-in. wheel does not make anything like a mileage proportionate to its cost; while we have had some 42-in. wheels that have made as much mileage as any of the 33-in. wheels, the great majority of the 33-in. wheels have made the most mileage. In fact, the mileage of steel wheels depends almost absolutely upon the quality of the tire. I don't know that the liability to sliding is any greater on the one sized wheel than the other; I have never been able to discover that matter. The liability to cut flanges I don't think is materially greater on the one than the other; but there is quite a number of reasons why a 42-in. wheel is objectionable under a passenger car. In the first place, it makes a car pretty high. It is a matter of some difficulty to get a car down as low as we find it necessary to run them, so as to draw them in the same line with the 33-in. wheel. We are obliged on our line of road to keep the height of our cars to quite a low point; running through to New York, the bridges on the New Haven road are very low, many of them, and we can't go above a certain height, and have to confine ourselves to that absolutely. Consequently, it is with some difficulty that we get our cars low enough on the trucks. I suppose if the road was rough, the bigger the wheel the easier the obstructions of the road would be gone over. I think the difference would be seen very much quicker on a road that was somewhat out of line and surface than it would on a road that was well ballasted and kept in line.

While we have a good many cars running on 33-in. wheels, we have not built any for the last eight or ten years that have been less than 36 in. We are using the 36-in. wheels now in preference to any other.

In using 36-in. wheels there is an advantage in regard to economy. We have generally believed that a steel-tired wheel is not sufficiently safe to run in passenger service if the tire is less than an inch thick. When the tire is less than an inch thick on a 42-in. wheel you have got to throw it away. But if you have a 36-in. wheel, and you wear off 1 in. of the tire, you have got it down to 34 in., which is near enough to run in freight servic with 33-in. wheels. The wheels can immediately b transferred under a freight car and make a good many thousand miles, when you would otherwise have to throw your steel away. For my own part, I would use no other than a 36-in. wheel, and I think our people are dropping into that idea.

I think a great many people have the idea that a 42-in. wheel will ride easier than a smaller sized wheel. While, as I said before, it may over rough places, on an ordinary well-ballasted track, I do not believe that there is one man in a thousand, if he don't know the size of the wheel under the car, can tell whether he is riding on a 36 or a 42, or even a 33, if the car is well hung. In my conclusions I agree with the gentleman that read the paper that the 36 in. wheel is the best sized wheel to use on the passenger equipment.

Mr. Griffin: I agree with Mr. Adams and Mr. Porcher as to size of wheels. The question of diameter of car wheels has concentrated to a difference of about 9 in., between 33 and 42, so that we find a 36-in. wheel is a very good average of the question as it stands from any standpoint, easier riding, less power to pull the train or any other consideration.

Mr. Porcher: Mr. Adams mentioned 300,000 as the average mileage for 33-in. steel-tired wheels. Now, in all kinds or classes of service, we get about 60,000 miles out of a cast-iron wheel, and the total cost of that wheel is not quite $5; and allowing that it takes six of those wheels to make one steel wheel, we have still got some money left. A 36-in. wheel of cast-iron wouldn't make quite that much; it would make about 57,000 miles. The steel wheels on one of the Western roads make not quite 300,000 miles for the 33-in. wheel and practically very little more for the 42-in. diameter.

Mr. Adams: I consider steel wheels the cheapest and a great deal the safest, and that is the principal point we make; even if they cost more, we would use them because of the safety. During 20 years there never has been an accident on a passenger car on our road from the breakage of a steel wheel. We have had them break, but there never has been an accident from a broken steel wheel on our road.

Now, in regard to the average mileage, I believe we have at present arrived at 300,000 miles in round numbers; it don't vary much from that one way or the other. Everybody will understand perfectly well that the poorest wheels give out first, and the mileage is constantly increasing, so that I think it would be safe to put the steel wheels at an average of somewhere about 325,000 miles.

Buildings and Structures of American Railroads.*

No. 14.—OIL-MIXING HOUSES.

BY WALTER G. BERG.

Oil-mixing houses have not been very extensively used on American railroads, although a few of the older roads have had small houses for mixing certain classes of oils in operation for a great many years. The Pennsylvania has maintained an oil-mixing plant at Altoona, Pa., for about twenty-five years, and has at present an oil-mixing house on each of its grand divisions. The Baltimore & Ohio operated a plant at their Mount Clare shops, Baltimore, Md., for nearly twenty years, until the latter part of the year 1889, when it was abandoned owing to the adoption of the policy of limiting the manufacturing required to be done by the railroad company. The New York, Lake Erie & Western operated an oil-mixing house at Susquehanna, Pa., for about three years, but abandoned it in March, 1888, owing to a change of policy similar to that of the Baltimore & Ohio. The Chicago, Burlington & Quincy has maintained an oil-mixing house at Aurora, Ill., for a number of years. The Lehigh Valley in 1887 built a very extensive oil-mixing plant at Perth Amboy, N. J., and is operating it with good results. The Chicago & Northwestern has an oil-mixing plant in operation in Chicago, Ill. The New York & New England maintains several oil-mixing houses along its route.

The usual method employed by railroad companies is to buy ready-mixed oils from manufacturers, whose charges are based more or less on the reputation of their goods, and the prevailing idea that great skill and experience are required to manufacture mixed oils. The so-called mixing of oils is purely a mechanical affair, so far as the operation of a plant is concerned, while the saving to be accomplished by the erection of railroad works is very large. The first cost and operation of a plant are very small compared with the annual expense for the purchase of oils on a large railroad system. The proportions of the various ingredients to use to produce certain mixed oils are readily ascertained from general rules already established by the leading railroad companies, and experience will soon demonstrate what changes might be desirable to meet any special local conditions found to exist. The foreman for an oil-mixing plant need not to be any more intelligent or skillful than the average railroad foreman in charge of a small shop or branch of a department. There is probably hardly a railroad in the country on which an oil-mixing plant could not be established, organized and operated by men now in its employ, with one exception only, namely, the necessity of having the regular or occasional services of a chemist to analyze and report on the quality of crude stocks before being purchased, and to settle any doubtful questions that may arise involving chemical researches. As a matter of fact, in receiving crude stocks the foreman of an oil-mixing works can conduct the standard tests, which are very soon reduced to a mechanical following out of established rules. Doubtful cases and reports as to the relative value or properties of several brands offered for purchase are in reality the main points requiring the attention of a chemist, after the working routine of the plant has been well established. In the purchase of the various brands of mixed oils from manufacturers, a railroad company would anyhow require practically as

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much chemical expert work, as if it were running an oil plant of its own, in case it wished to feel certain of the quality of the mixed stocks purchased. The abandonment of the oil-mixing plants on the Baltimore & Ohio and on the New York, Lake Erie & Western cannot be considered as indicative of the failure of the methods used, as they were due to a change of policy or local conditions on the roads mentioned. The maintenance of special plants on the Pennsylvania, on the Chicago, Burlington & Quincy, on the Chicago & Northwestern, on the New York and New England, and on the Lehigh Valley, is sufficient evidence that on these large systems the plan has worked successfully. It is not only the saving in first cost of the oils that is material in the consideration of the economy of the subject, but the control of the uniformity and reliability of the oils shipped out for use along the road is a matter of prime importance.

Relative to the details of oil-mixing plants on railroads, the storage of the main supply of barreled crude and mixed oils in a separate storage shed or building, away from the oil-mixing house proper, is advisable. The oil-mixing house proper is usually divided into a storage room and a mixing room. Where the mixing tanks are located in a cellar or basement, the room above them is used to dump oils from into the tanks below.

The mixing in the mixing tanks is done by hand with paddles or dashboards, or by machinery with paddles attached to shafting operated by a steam engine, or by blowing air into the oil at the bottom of the tanks with blowers operated by steam power. Mixing by hand has been in use for a great many years on the Pennsylvania, the Baltimore & Ohio, the Chicago, Burlington & Quincy, and the New York, Lake Erie & Western; it consists virtually of stirring up and churning the oil by wooden paddles or dashboards worked by hand from the top of the mixing tanks, and it is probably the best system to adopt for a small output, which would not warrant the introduction of steam power and special appliances. The Pennsylvania has, to a large extent, introduced paddling by machinery in its oil-mixing houses, in addition to the older method of paddling by hand.

The method of agitating the ingredients in the mixing tanks by blowing air into the mixture at the bottom of the tank has been adopted within recent years by some of the leading manufacturers of illuminating and lubricating oils in this country and abroad, and is the method practiced by the Lehigh Valley. Railroads purchasing mixed oils from dealers use brands manufactured by the blowing process to a large extent. Dr. Charles B. Dudley, Chemist, Pennsylvania Railroad, considers that the method of mixing oils by blowing air into them is not desirable, as it oxidizes the fatty oils and thereby leads to difficulty. Other chemists and manufacturers interested in the blowing process claim, that the amount of oxidation which takes place is not sufficient to cause any deterioration in the lubricating or the general working qualities of the oils. It is also claimed that the mixture is more thoroughly agitated by blowing than by paddling, as in the latter process certain currents are created, and the different particles are not so finely subdivided as by the air forced through the oil in every direction from the bottom up, causing heavy particles sinking to the bottom to be thrown up toward the top of the tank.

In designing a plant it must be borne in mind that it is essential to keep the main stock, so far as possible, isolated from the oil-mixing house proper, and in the latter it is desirable, if feasible, to keep the mixing tanks in a separate compartment. The most scrupulous cleanliness is requisite to reduce the danger from fire. The fire service provisions should be the best obtainable. The plant should be located as far as possible away from other important stuctures or yards, so that, in case of a fire, its spread would be limited or not attended with very serious losses. No open lights should be allowed in the building. The lighting should be by electricity or by lamps with reflectors, set in recesses in the outside wall, the recess being closed on the inside of the house by a fixed glass panel and on the outside by a small door. A fireproof construction of the building is desirable at all important locations or where the plant contained in the building is extensive. The heating of the building and the oil in the tanks should be done by steam from a special boiler, located in an annex to the main building, or from some boiler in use in the vicinity.

The following descriptions of oil-mixing houses refer to oil-mixing plants that are or have been in actual use on railroads in this country and will therefore prove of particular interest.

Oil-Mixing House at Aurora, Ill., Chicago, Burlington & Quincy Railroad.—The mixing of oils on the Chicago & Burlington is done at Aurora, Ill., the method in use being shown in figs. 1 and 2, prepared from sketches and data furnished by Mr. Wm. Forsyth, Mechanical Engineer, Chicago, Burlington & Quincy Railroad. The crude stock is received at the house in barrels and dumped, as required, into a sheet-iron receiving tank, 4 ft. × 6 ft. × 2 ft. deep, located in the house in front of a large double door leading from a platform into the house. The top of the receiving tank is level with the door sill and the floor of the platform, so that barrels can be rolled from the platform on to the receiving tank, dumped and then rolled back and away from the house, the space in the interior of the latter being limited. This receiving tank serves to measure the ingredients, which form the mixtures for any particular oil. Underneath the house in a cellar there are two square sheet-iron

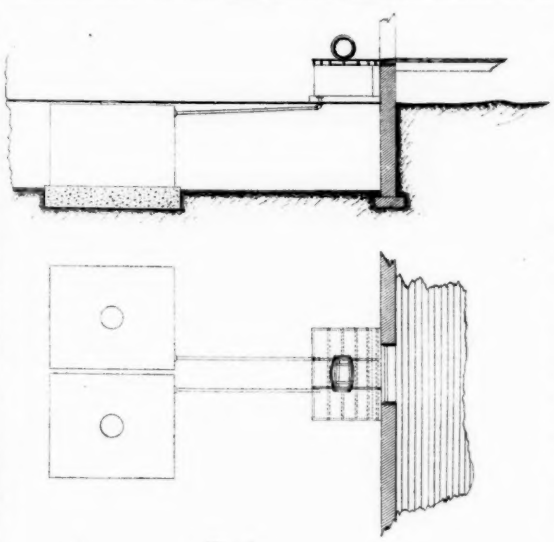


Fig. 1.

Fig. 2.

mixing tanks, each of 60 barrels capacity, with a manhole on top corresponding with an opening in the floor of the mixing room. These tanks are connected with the receiving tank by pipes, as shown. The mixing of the oils is done by hand by means of a wooden mixing dash (Fig. 2) inserted into the mixing tanks through the manholes on the top, the oil being churned by the dash until thoroughly mixed. The dash consists of a 9 in. × 15-in. square board perforated with 26 holes, 1½ in. in diam., with a wooden handle, 11 ft. long. The mixed oil is transferred by means of hand pumps to storage tanks or drawn into barrels for shipment over the road.

Oil-Mixing House at Meadow Shops, Newark, N. J., Pennsylvania Railroad.— The oil-mixing house of the Pennsylvania, located at Meadow Shops, Newark, N. J., shown in figs. 3 and 4, is a one-story frame building about 50 ft. × 175 ft., sheathed with corrugated galvanized iron, roofed with tin and floored with plank. It is surrounded on three sides with wide platforms, which serve to store barrels and facilitate handling of supplies and materials to and from cars on tracks, one on each side of the house, the floor of the house and platforms being level with the car floors. The oil-mixing plant is at one end of the building, and at the other end a small

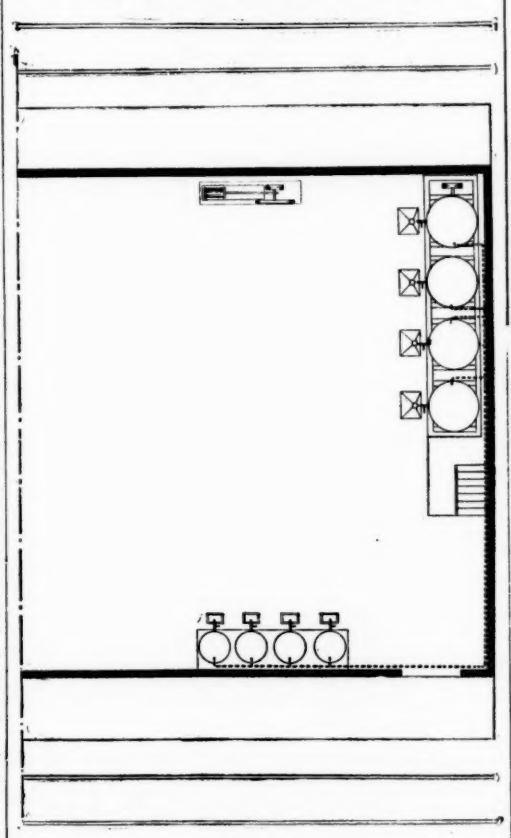


Fig. 3.

part of the floor space is set apart for the storage of waste, while the balance of the house is used for the storage of oils in barrels. The mixing tanks are in a small cellar, and immediately over them, raised above the floor of the house, are the storage tanks for mixed oils, from which the mixed oil is drawn into barrels for shipment over the road. In addition to these tanks there are on one side of the house, as shown on the plan, a number of smaller receiving tanks for mixed oils for local use at the shops and for the engine and car service in the vicinity, the oil being drawn into cans or buckets, as required. All crude stocks arrive at the house in barrels, and, after mixing, the mixed oils are drawn into the same barrels for shipments out of the house. The account of stock and the quantity of the various ingredients used in making each batch of oil are tallied by actual weight, every barrel being weighed on a small portable scale. The different lots of crude stocks arriving at the house are kept separate, and the barrels of mixed oils from each batch are given distinguishing marks. There is a very simple and efficient set of books kept, so that at any time it can be ascertained exactly what lots of crude stocks were used in making the mixed oil contained in any particular barrel shipped out of the house.

The process of mixing the oil consists of agitating it inside the mixing tanks by means of a system of paddles connected to a vertical shaft inside each tank revolved by the proper gearing and machinery. In order to create cross currents of the oil in the tank, the movement of the paddles is reversed from time to time, and fixed paddles are attached to the sides of the tank between the revolving paddles and pitched in an opposite direction. There are four circular sheet-iron mixing tanks in the cellar, the crude stocks being dumped into them through a 16-in. × 20-in. opening in the floor over each one of them. These mixing tanks are 4 ft. 6 in. in diam. by 7 ft. 8 in. high, and have a capacity of 16 barrels each. The paddles are 14 in. wide at the widest part and ¼ in. thick; the revolving ones are made of wrought iron and the fixed ones of steel, their shape being similar to the blades of a screw propeller. The paddles make about 15 revolutions per minute, and it takes about 3½ hours to mix a batch of oil. The speed is regulated by the quantity of oil in the tank, so as not to throw the oil out over the top. In front of each mixing tank in the cellar there is an ordinary 2-in. plunger pump, making four pumps in all, connected with one continuous pump shaft, which pumps serve to transfer the mixed oil up to the storage tanks or the receiving tanks for local use. The power to drive the paddles and pumps is supplied by a small stationary engine, the countershaft of the mixing paddles being turned by a belt and the pump

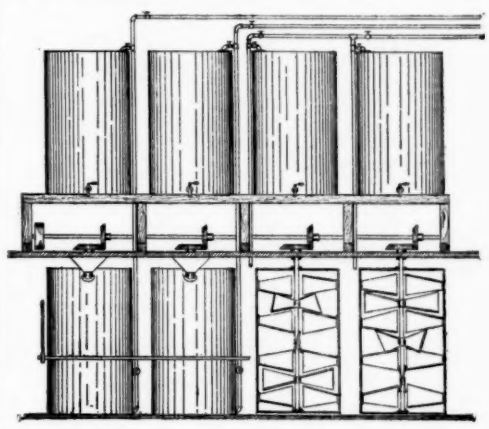


Fig. 4.

shaft by a connecting rod attached to the fly-wheel of the engine. The paddle shafts are thrown in and out of gear by means of clutches and levers situated above the floor just below the storage tanks; but it is necessary to go down into the cellar to start or stop the pumps. The four mixing tanks can be worked independently or all together, or mixing can be done in some of the tanks while pumping is going on from the others. There are four storage tanks placed on a raised trestling immediately over the mixing tanks, as previously explained. These storage tanks are of the same size as the mixing tanks. The receiving tanks for local use are smaller. All pipes for transfer of oils are 2 in. in diameter. The oils in the tanks are kept liquid by a single coil of 1-in. steam pipe in the bottom of each tank, the general temperature inside the building, especially in the small mixing cellar, being kept quite high by steam coils along the walls. Steam is supplied from the boiler connected with the shop system in the immediate vicinity. There is no provision made for lighting the building, as work is not allowed to be prosecuted after dark. The provisions for protection against fire consist of lines of hose connected with the water system, kept uncoiled along the floor of the house at night ready for use, and fire alarm boxes in the special circuit connected with the shop system.

This house has been in operation for about eight years and supplies all the mixed oils and distributes all the cotton waste used on the New York Division of the road. There are about 700 barrels of oil mixed and distributed per month. The force employed consists of about three to five men, exclusive of the foreman, and they are kept busy for about nine hours a day the year round. The oils mixed are, as a rule, passenger engine oil, engine oil, navy sperm oil, signal oil, and heavy lubricating oils. One of the mixing tanks is used exclusively for engine oils, another one for illuminating oils, and the remaining two for heavy lubricants. Great care is taken to keep the dark and light oils separated in the pipes and mixing tanks, so that the remnants of one batch will not injure the next batch of a different grade. In dumping the oils the usual practice of boring vent holes in the barrels is avoided by the use of a short piece of ⅛-in. pipe, bent in the shape of an elbow, which is inserted in the barrel through the bunghole as the barrel is rolled over the dumping trough, and serves to introduce the necessary air to allow the barrel to discharge quickly.

The general layout of this plant is good and the operation very methodical and economical. The most serious objections are, that the tanks are located too close to the sides of the building, giving little opportunity for free inspection and repairs. The cellar or pit in which the mixing tanks are located is very small and wet, and repairs are very difficult to make. Great care has to be exercised to prevent chips and other foreign matter from getting into the mixing tanks, as the paddles break very easily and repairs are very difficult to make. The location of the storage tanks immediately above the oil-mixing tanks cannot be considered as advantageous as locating the storage tanks sideways from the mixing tanks, although the first arrangement offers certain advantages.

(TO BE CONTINUED.)

A New Universal Grinding Machine.

We present herewith several views of a new grinding machine constructed by the Brown & Sharpe Manufacturing Company, of Providence, R. I.

Figs. 1 and 2 give front and rear views of the new machine, and figs. 3 to 8, inclusive, give detail and sectional views of the more important operating parts. The general aim of the construction has been to provide against machine vibration and to place every portion in easy access. The base is heavy and substantial, and includes in one piece the bed proper of the machine. The sliding table carrying the stocks moves (see fig. 3) upon the bed on one V-groove and one flat face. The head and foot stocks are each mounted upon an adjustable swivel face, and can be moved toward and from each other in T-slots in the sliding table. Their centres can, therefore, be set at any angle with the table slides for the grinding of tapers without throwing the stock spindles out of line. For accurate adjustment to any taper, a graduated scale showing inches per foot or degrees is provided, also a screw for controlling the same.

The grinding-wheel bed is adjustably supported upon the machine base to the rear of the bed slides. It is capable of horizontal radial adjustment to any desired

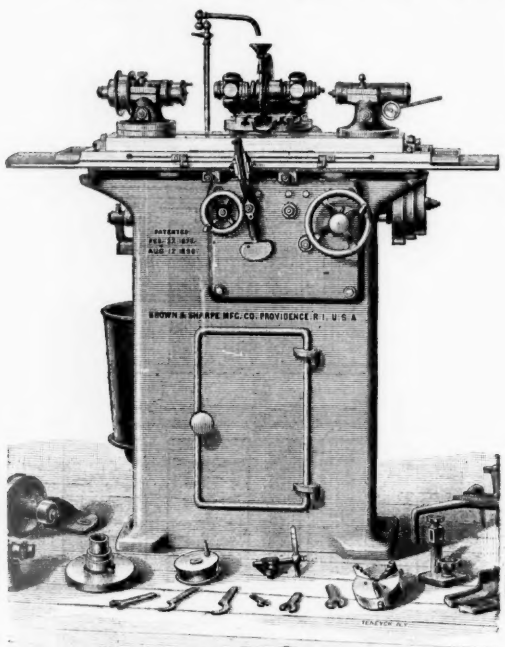


Fig. 1.

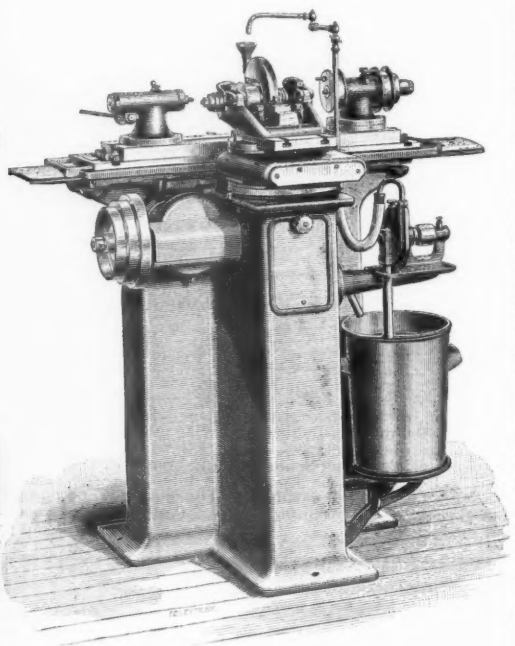


Fig. 2.

UNIVERSAL GRINDING MACHINE.

angle with the sliding table (see fig. 2). The object of such adjustment is to provide facilities for bringing the face of the wheel either to a parallel or not with the direction of its to-and-fro movement.

The motion of the sliding table is automatically reversed by a lever, the throw of which is controlled by adjustable dogs after the manner of the planer bed. For specially delicate adjustment, a patented device is attached to this lever. A cushion attachment permits of the reversing of sliding table movement without shock or jar. When necessary, a path can be opened permitting the dogs to pass by the lever without acting upon it, thus permitting the movement of the table to any travel for trial work, without destroying the lever adjustment.

The cross-feed bringing the wheel up to its work is operated from the front of the machine by a handwheel quaduated to read to thousandths of an inch.

The head stock shown in figs. 4 and 5 is fastened to the table by a clamp screw, and swivels upon a centra pin. The spindle is of tool steel; the bearings are hardened, ground and lapped. The boxes are of phosphor bronze. Wear is taken up by screws *a*, and screws *B* limit the extent of action of screws *a*.

The end thrust of the head stock is taken by a shoulder on the spindle and wear adjustment is taken care of by means of a nut at the rear end of spindle. The head stock is provided with a pulley for driving the spindle and with small and large dead centre pulleys, to permit of grinding in a chuck on spindle or upon two dead centres, or upon one dead and one live centre.

The foot stocks shown in figs. 6 and 7 are mounted similar to the head stock. As may be seen, the spindle is operated by means of a lever, and a stiff spring holds the work between the centres, allowing for any heat expansion of the metal operated upon.

A section veiw of the wheel standand spindle is shown in fig. 8. The spindle is of steel, hardened, ground and lapped. End play is taken up by means of nut *A*. The bearings are of phosphor bronze and are each adjustable by means of end nuts *C* and *D*. Bearings, boxes, spindle and wheel can be readily removed without disturbing their adjustment.

Special attachments are provided for internal grinding. Holes from ¾ in. and upwards in diameter and up to 5 in. deep can be ground. Overhead shafting, hangers, etc., necessary for all varieties of work are provided with directions as to erection and use.

The machine will swing work between its centres 8 in. diameter and 16 in. long. The swivel table will swing to either side of its central position for grinding tapers from 0 in. to 1½ in. per foot, or from 0 deg. to 3½ deg. in angular measurement. For work on the face plate or chuck the head stock can be swung to any angle within the circle. The grinding-wheel slide has a movement of 4 in., and may be fed at any angle from 0 deg. to 90 deg. on either side of a line at right angles to the sliding platen.

The extreme floor space occupied, including projections and travel, is 36 × 69 in., and the shipping weight is about 2,600 lbs.

The Electric Light in Railroad Service.*

Among the first to make use of the advantages afforded by electric lighting were the steam railroads, not as a means for lighting trains, but for lighting buildings, etc. In the year 1881 the Pennsylvania Railroad introduced its first electric lighting plant in a new shop in Altoona. That proved quite a success. It might also be mentioned that the same dynamo and lamps are in use to-day. In the year 1885 the Pennsylvania Railroad commenced lighting its depot shed in Altoona by arc light from its own dynamos.

The question then presented itself, Can freight yards be successfully lighted by electricity to reduce accidents, facilitate business and prevent breakage of cars and contents? The two latter items are quite a money consideration on any railroad.

In Altoona, when drawing up the plan for lighting the yards, the question presented itself: How high and how near together shall the lights be placed? For lighting where engineers and trainmen have to work, it is not the brilliant light that is wanted, but the evenly distributed light. If a light be too brilliant, trainmen when near lamps will be partially blinded for a short time; so in the event of their leaving a lighted space it would be difficult for them to distinguish objects or signals.

In order to get an evenly distributed light, lamps at Altoona were placed on top of 65 ft. poles set so as to illuminate switches and crossovers where the yards were narrow. Where yards were wide and long, lamps were placed about 600 ft. apart, a row on one side of the yard and a row in a broad alley that was wisely left between tracks near the opposite side of the yard, the lights of the two rows being zigzagged to prevent lshadows and to better diffuse the light. This plan of lighting does not make a brilliant light at any point, it being possible but difficult to read fine print. A light more like moonlight was the result, and proved very good in practice. Even a clear globe was objectionable on account of the shadows with side arms. A lower-half ground globe was preferable, it having been proved by experience that it was better to lose a little light than to have shadows.

Some noticeable results followed the introduction of this light. It enabled the car inspectors to examine cars much more thoroughly, and, as you all know, perfect car inspection is very important. A decreased amount of pilferage also followed. The breakage of cars and their contents was but little, if any, greater at night than in day time. I cannot say how much money was saved by reduction of pilferage and breakage of cars and contents, yet I believe it was really more than the cost of maintaining the lights. Undoubtedly the introduction of the electric light has prevented accidents to employés; of course I cannot say to what extent.

The electric lights are a great help in shifting cars, as they enable the trainmen to see the tracks and position of switch points about as well at night as in the day time, also in coupling and dropping cars they enable the brakeman to gauge the distance the cars are apart fully as well at night as in the day time, and they also assist in dropping or switching cars very fast, as is often necessary during a time of increased traffic. They enable the switchmen in the towers to tell when a car is over a switch, so that they can quickly throw the switches with less danger of throwing the cars off the track or onto the wrong track.

A few words about the erection of arc lamps and poles for freight yards. Poles must be very well set in the ground, and guyed so as not to sway from heavy rolling stock passing, or from wind. A good, true chestnut pole, if possible to obtain, answers very well. It will cost, when shaved, stepped and erected with hood, about $35.

Maintaining arc lamps near railroads is quite different from maintaining lamps in most stores. If there is a poorly insulated part in the lamp, the soot will soon find a path for the current across the poor insulation, and out goes your lamp. Your cut-out contacts will corrode very fast. When it comes to your rods, expect to have a lot of dirty ones. In a railroad yard there are things to contend with not common with most lighting, and that is smoke and steam. I have seen poles covered from one end to the other with a film of soot from engines. This, in getting on the hanger boards, is sure to make escapes unless the insulation be very good. The insulation should also be good to enable the inspector to work at a lamp, in case of its failing to burn, when the current is on. Get a good, reliable, direct current, double carbon arc lamp that is well insulated. A lamp that is heavy, bulky, or has liquids is not well adapted for the purpose, on account of the difficulty of carrying it up the pole. Do not rely on the hooks of lamps for connection between the lamp and the hanger board, or they will corrode and cause trouble. It is better to always put a piece of flexible wire from the hanger board to the lamp to carry the current. Always use a good insulated wire and good insulators when running up poles or side arms. It is better to splice on a piece of the very best insulated wire. Experience has proved that the wooden part of hanger boards is better for having some water-proof insulation between it and the side irons to prevent leaks. I do not favor double-pole switches on hanger boards in freight yards, as they require extra contacts, the brass work of which soon corrodes so as not to make good connections, and leads to trouble.

If you once properly put electric lights in a freight yard, you will never get them out again: the trainmen will not stand it. But great care should be taken to place lamps so they will not interfere with signals. The electric light is rather a help to distinguish the position of the semaphore arm, although trainmen at night look for the color of the lens rather than the position of the arm. If it comes to a question of moving an electric light or a signal, you will find that the electric light will have to go every time, as railroads will not allow any interference with signals. If you go too high, you will not get the full benefit of the light, as has been proved where the tower system of lighting is in use. In laying out freight yards a broad alley, say 12 ft. between tracks, should be allowed for placing the lamp poles, where the yards are over 300 ft. wide.

As to the other uses for electric lights for railroads, I do not know that there is much out of the regular run. The light is used quite extensively for lighting depot sheds, where it is more economical than gas and decidedly better. This class of installation requires the very best of work and insulation, as the smoke and steam nuisance enters in here. Experience has proved that the arc light is much superior to the incandescent for depot shed lighting. With incandescent lights the necessary volume of light is costly to maintain, and also the globes of incandescent lamps soon become dirty from steam and smoke, which interferes with the light or, if cleaned off, necessitates considerable labor.

For freight transfer stations the arc light is very satisfactory. It enables the men to quickly distinguish marks on merchandise and also enables the foremen to see what the men are doing, preventing loafing. One 2,000 nominal candle power arc lamp to about 1,500 sq. ft. of floor space will generally light a transfer station where lamps can be zigzagged. When transfer stations are narrow, more light per square foot should be allowed. On a platform about 10 ft. wide, as they generally are, one light every 60 ft. gives good illumination.

I doubt if the arc light can compete with gas for this purpose as far as cost is concerned, taking transfer stations as they are, generally lighted by gas, and as they should be, lighted by arc lights, yet I believe, taking the amount saved in labor and from pilferage, that the electric lights more than pay for themselves. Another point comes in here. If you give men good light it brightens their spirits up and they will work much more cheerfully; and getting men cheerful means more work done.

If any inventor wishes to get up an electric locomotive headlight, let him confine himself to one of low candle power. I do not think one of over 100 candle power will be in demand until railroads are illuminated from one end to the other by electric light, which will be the case in the future, and then the headlight will not be required. These points are necessary for an electric headlight: First, and all important, reliability; second, simplicity. Economy you can leave out. If you can get 50 per cent. of what can be attained in a station, it will do. One thing must be borne in mind—engineers are not electricians. Thus a dynamo and lamp must be as simple as the air brake, and no more liable to get out of order.

Electric lighting of trains is a luxury to-day, and will continue to be until some more economical plan is invented. The advance that is being made with the use of gas as an illuminant for cars is leaving electricity behind. From the best information I can get, it costs 50 cents per hour to light a car by electricity from storage batteries, against five cents per hour from carbureted air.

The electric light is used to some extent by different railroads for lighting wrecks or any construction work that requires night work. For this purpose the Pennsylvania Railroad and the Cumberland Valley road have a car fitted up with boiler, dynamo, engine, water tanks and coal bunker, and all the tools necessary for a central station.* With a car of this description, quick work in getting lamps in place is all important. In one case after the Johnstown flood I, with the help of four men and the engineer, put up six arc lamps, put up the poles for the lamps, which were designed for the purpose and carried on the car, ran the wire, coupled up the lamps, and had the lamps going in 35 minutes from the time we, with the car, lamps, poles and wire, arrived on the ground. The lights were distributed some distance, one being about one-third of a mile away. I doubt if construction work was ever done quicker.

I will not go into a description of this car, as it was very ably explained by Mr. W. F. Taylor, of Altoona, at the convention of railroad telegraph superintendents at Niagara Falls, June 19, 1890.

* By W. H. Markland, Pennsylvania Railroad. Read before the National Electric Light Association, Providence, R. I.

* See *Railroad Gazette*, June 21, 1889, and July 4, 1890.

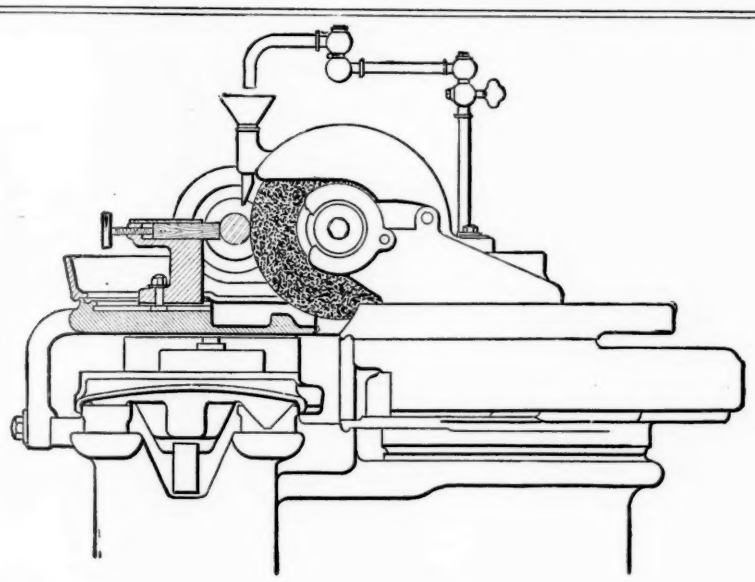


Fig. 3

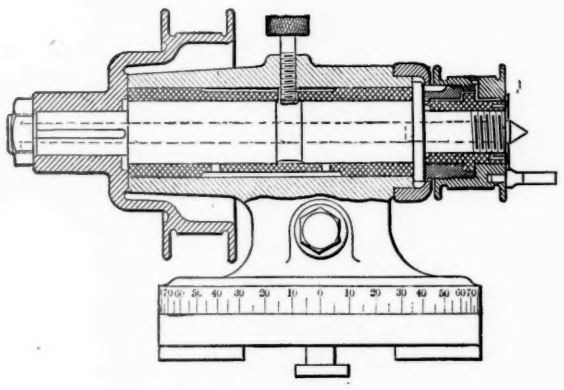


Fig. 4.

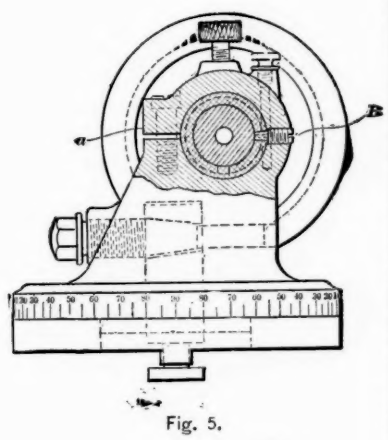
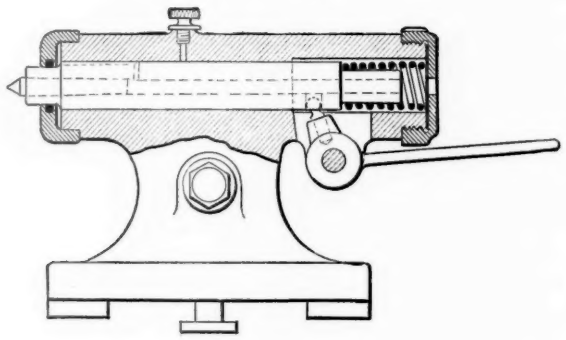


Fig. 5.



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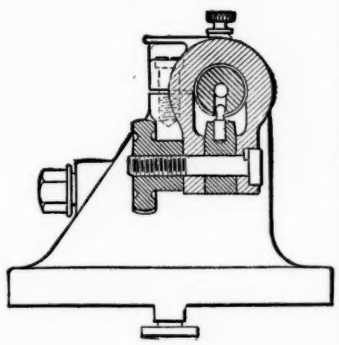


Fig. 7.

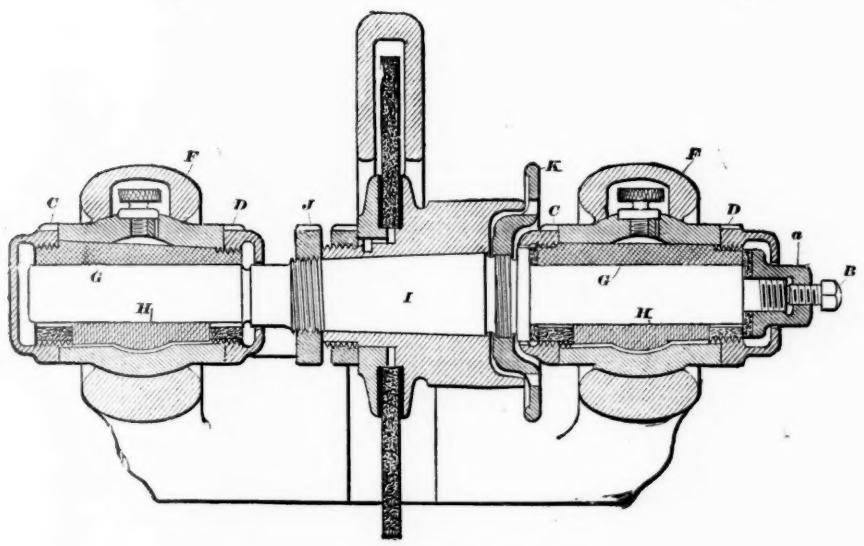


Fig. 8.

UNIVERSAL GRINDING MACHINE.

Made by BROWN & SHARPE MANUFACTURING CO., *Providence, R. I.*

To give an idea of what the Pennsylvania Railroad Company thinks of the electric light, I might say that its new Juniata shops at Altoona, having about 100,000 sq. ft. of floor space, are lighted entirely by the electric light; there is not a pipe for illuminating gas in any of the buildings. All the traveling cranes are run by electricity. I doubt if any station, central or isolated, has more reliable or better designed appliances or more artistic work than can be found at the Juniata shops of that company.

Uniform Standard Time.

At the Annual Meeting of the American Society of Civil Engineers the Special Committee on Uniform Time presented its report.

In consequence of the memorial to Congress from the Society, a bill has been introduced in the Senate, read twice and referred to the Committee on Judiciary. This bill legalizes the hour meridian system commonly called standard time, also the 24-hour notation. While it is not thought likely that the bill will be passed at this session, it probably will be passed by the next Congress.

At the last report of the Committee it was said that a majority of the railroad managers in the United States were in favor of the 24-hour notation. The Committee is now enabled to report that 403 railroad officers have communicated directly with the Society, expressing themselves in favor of a change to the 24-hour system. The aggregate length of railroad with which these officers are connected is estimated at 140,000 miles, which is about 80 per cent. of the total mileage of the United States and Canada. From these facts the Committee concludes that the proposal to adopt the 24-hour system on the railroads of this continent is generally favored, and that it only remains for the responsible officers to act in accord and fix upon some date when the new notation may be put into use. The Committee therefore recommends that this matter be brought by the Society formally before the General Time Convention.

The Committee reports that the advantages of the 24 hour notation are beginning to be recognized in various branches of civil life, and it believes that when this system is adopted by the railroads it will gradually become universal. The Committee reports further that a communication has been received from the Director-General of Railroads in India announcing that the 24 hour notation has come into use on all railroads throughout the Indian Empire.

A year ago the 24 hour notation was in use on less than 4,000 miles of railroad; it has now been permanently adopted on more than 20,000 miles.

The time reform movement has attracted much attention in the central European countries, and there is every prospect of the principal of standard time soon being adopted throughout central Europe. Moreover, the Committee learns from official correspondence that the British Government has taken steps which will tend to promote the general adoption of standard time and the 24 hour notation in all the British possessions. A committee of the most distinguished scientific authorities in the service of the British Government has reported in favor of such a reform. The railroad companies of England, Ireland and Scotland have been recommended to adopt the 24 hour notation.

There is reasonable expectation that the general introduction of the 24 hour notation on the railroads of the United States and Canada will shortly come about, and this the Committee feels will properly terminate its labors, which have already endured over 10 years.

The report was accepted and the Committee continued, and a resolution was adopted that copies of the report be brought to the attention of members of the General Time Convention and railroad authorities generally of the United States and Canada. Mr. Fred Brooks presented a minority report, which is printed in the Proceedings.

The Lake Erie & Ohio River Ship Canal.

A joint resolution adopted by the General Assembly of Pennsylvania in 1889 authorized the Governor to appoint a commission to inquire into the feasibility of connecting the waters of Lake Erie and the Ohio River by a ship canal, and to determine by actual survey upon the most practicable route for such canal; the sum of $10,000 being appropriated to defray the expenses of the commission.

The Governor accordingly appointed as commissioners John A. Wood, W. Shallenberger, Eben Brewer, John M. Goodwin and Thomas P. Roberts. These gentlemen organizing themselves into a board with Mr. Wood as President, Mr. Shallenberger Treasurer, and Mr. Brewer Secretary, entered upon an investigation of the physical characteristics of the country, the commercial statistics of the various ports and waterways, and of the teachings of experience in canal construction and operation at home and abroad.

The report shows by carefully compiled tables that the coal and ore trade alone between Pittsburgh and the great lakes would give a good return on the estimated cost. The development of the already important iron industry of the Mahoning and Shenango Valleys, as well as the demands of commerce generally, offer ample inducements for the construction of the canal. Added to these are the considerations of military policy which call for some means of putting an armored fleet into the waters of the lakes. Under our present treaty with Great Britain, neither country may build or maintain battle ships on these waters; but with the improvements soon to be made in the Canadian canals, no less than 100 British gunboats will become available for lake service.

So far as construction is concerned, there are no difficulties other than those which have been successfully overcome in other places, such as in the Suez and Manchester ship canals. The following table will show a partial comparison of the general cross-section dimen-

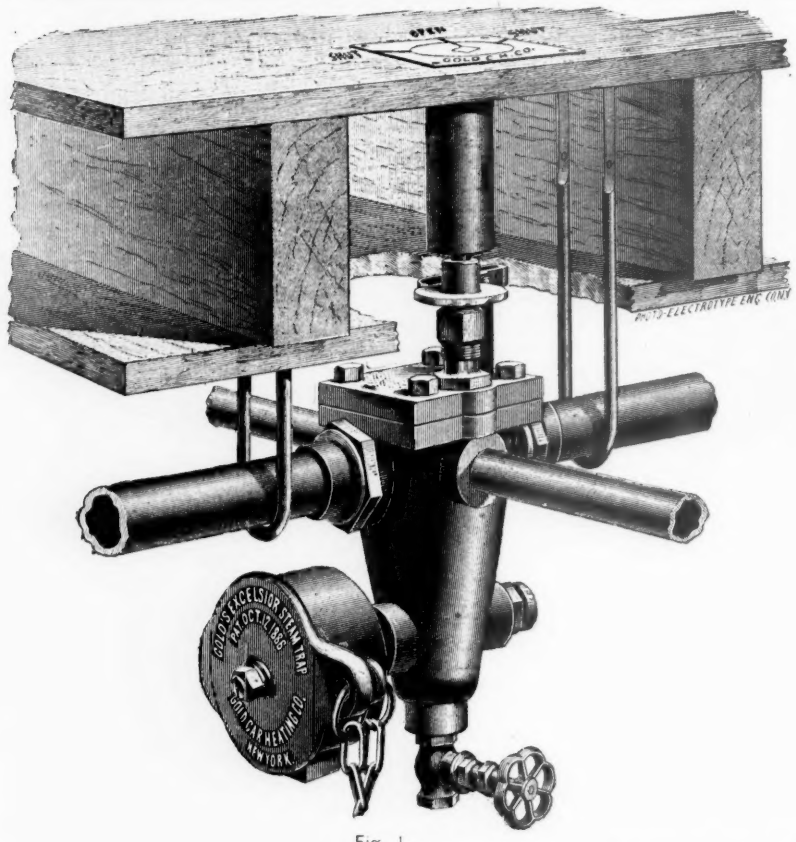


Fig. 1.

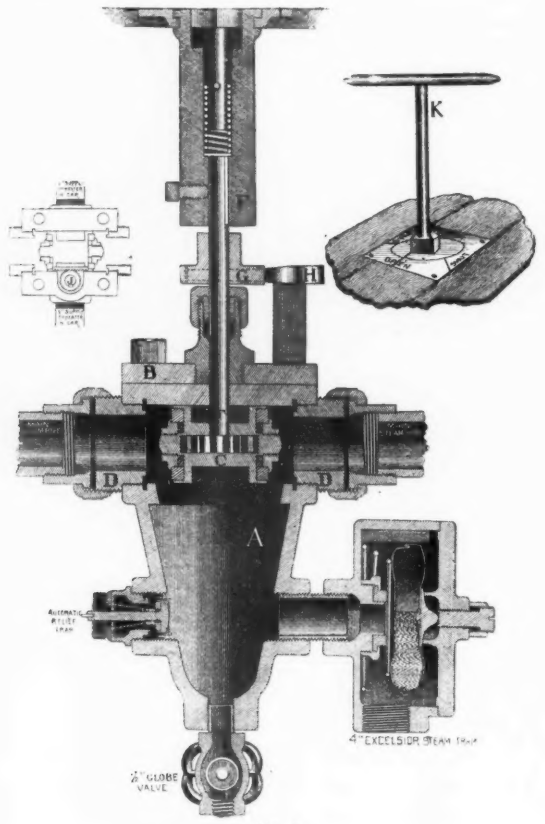


Fig. 2.

GOLD'S TRAIN PIPE VALVE.

Made by the GOLD CAR HEATING CO., *New York.*

sions of the Manchester and Suez canals and the proposed Lake Erie & Ohio River Canal:

	Bottom width.	Surface width.	Slope	Depth.
Suez	72	187	2.2 to 1	26
Manchester	120	180	1.25 to 1	26
L. E. & O. R.	100	152½	1.75 to 1	15

The Manchester Canal has a slope faced with rough stone on a rubble, backing, while for the L. E. & O. R. canal it is proposed to build a brick revetment extending 3 ft. above and below the surface and resting on a base of sandstone. It is contended by some that the proposed depth of 15 ft., even if sufficient for the early demands of the traffic, would in a brief time be found inadequate to the service, and in this connection it is suggested that the locks be built of such a depth that no extensive alterations in them would become necessary to a later deepening of the channel. The commission concludes, however, that the largest vessels navigating the lakes can profitably use the canal at a depth of 14 ft., and that when a greater depth is required it will be better to make a redistribution of locks to overcome the difference in altitude between the summit level and Lake Erie on the one hand, and the Ohio River on the other.

Many routes have been considered, and the Erie Extension Canal, or the "Old Canal," has furnished a basis for this part of the investigation. One great limiting factor is the water supply for the summit level. The ridge of high ground which divides the watershed of Lake Erie from that of the Shenango Valley terminates in a promontory very near the Ohio and Pennsylvania state lines and overlooks a wide plateau, some 65 ft. lower. For many reasons it is believed that this point should be included in the route, and careful estimates seem to assure a plentiful supply of water by means of storing the flow from neighboring streams and without resorting to pumping.

It is also believed that the success of the scheme will require the construction of the channel as far as Pittsburgh; but while the commission recommends Conneaut Harbor as the lake terminus, there is much said in favor of Erie, especially on account of harbor facilities and as a strategic point from a military view.

The length of the canal as proposed will be about 129 miles. The highest point on the route is mile post 19 on the state line, which has an elevation of 1,016 ft.; the total ascent from the lake being 445 ft., or an average of 30.2 ft. per mile. This is accomplished by means of 25 locks, and the descent to the level of Pittsburgh by 26 locks. It is proposed to operate the locks by turbines. The cost of the entire work is estimated at $26,375,188.

Accompanying the report are a number of valuable appendices by Mr. John M. Goodwin, including those on Water Supply Storage Reservoirs; Shipping and Commerce of the Great Lakes; Nominal Tonnage and Actual Burden of Lake Vessels; Transportation by Water and Rail; Distribution of Iron Ore from Lake Erie Ports in 1889; Production of Pig Iron; Evaporation; Infiltration and Leakage. There are also papers by Mr. Thomas P. Roberts on the Water Supply of French Creek; Route to the Lakes via Allegheny River from Pittsburgh; River Interests at Pittsburgh, and Inland Navigation of France.

Gold's New Train Pipe Valve.

We show herewith Gold's new train pipe valve, by means of which the steam supply for each car is controlled by one movement from the interior of the car, thereby doing away with the necessity of cocks under the platforms, simplifying the application of any system of equipment for steam heat from the locomotive and reducing the cost.

Fig. 1 shows the valve connected to the main steam supply pipe, and fig. 2 is a section of the same.

The main body *A* is an iron casting with seven openings, having a bolted lid or cover *B*, to allow of the proper adjustment of the piston valve *C*. The valve is fitted at either end with composition disks, with seats on the inside of the 1½-in. brass unions *D*, by means of which the valve is connected to the main steam pipe.

The piston valve controls the supply of steam from car to car and from the main steam pipe to the interior of the car. It is operated by a rack and pinion with stem *E* coming down through the floor and the cover of the main casting. A small stuffing box makes the necessary steam-tight connection at the point where the stem goes through the lid of the body. This stem is cast with a feather, upon which an adjusting stem *F*, with spring, is held by means of a small nut, and this adjusting stem is run into the car, flush with the floor and has an index plate screwed down over it, which shows the movement of the valve.

The valve is opened or closed by the use of a hand wrench or key *K*, and, as is plainly indicated on the index plate, a quarter movement either way opens or closes the valve. So, when the index is at open, the steam passes through the valve and on to the next car, and also through the 1-in. connection into the car. If the car is at the end of the train the index should point to shut, nearest the rear end; this closes off steam on the main from that point, still allowing steam through the 1-in. connection for the car, the piston valve being open at each side for passage of steam to the car.

The stem is held in place by means of a steel disk, *G*, laid out in sections according to the index plate, and this disc is held in its position by a strong steel spring, *H*, which prevents any movement of the valve except by means of the wrench.

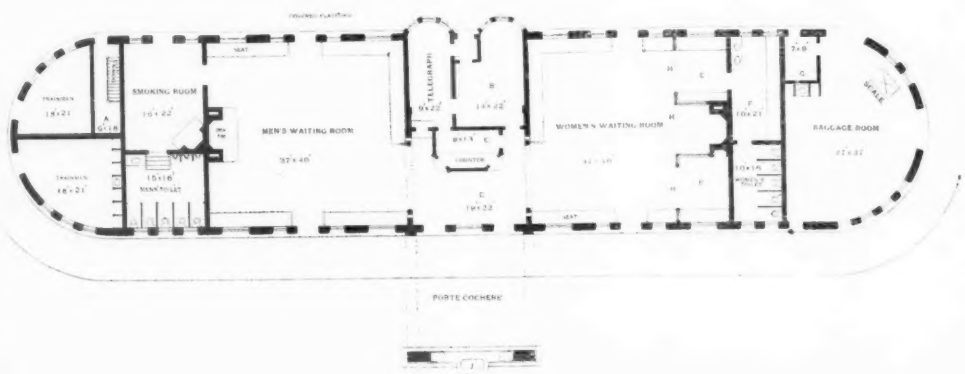
Four of the openings in the body are now used, two for the main supply and two for steam to the car, as steam may be taken from both sides of the valve into the car if necessary, or one may be plugged up if it is needed for one side only. The body is tapped on either side below the valve for 1-in. connection, and on one side is placed an "Excelsior" steam trap and on the other an automatic relief trap; these traps, the one acting under variation of temperature, the other under variation of pressure, discharge all the water of condensation which may collect in the train pipe.

At the bottom of the body is ½-in. globe valve, which may be opened to blow off any scale or dirt which may find its way into the body.

This valve is the invention of Mr. E. E. Gold, and is now being applied.

Old Colony Passenger Station at Fall River.

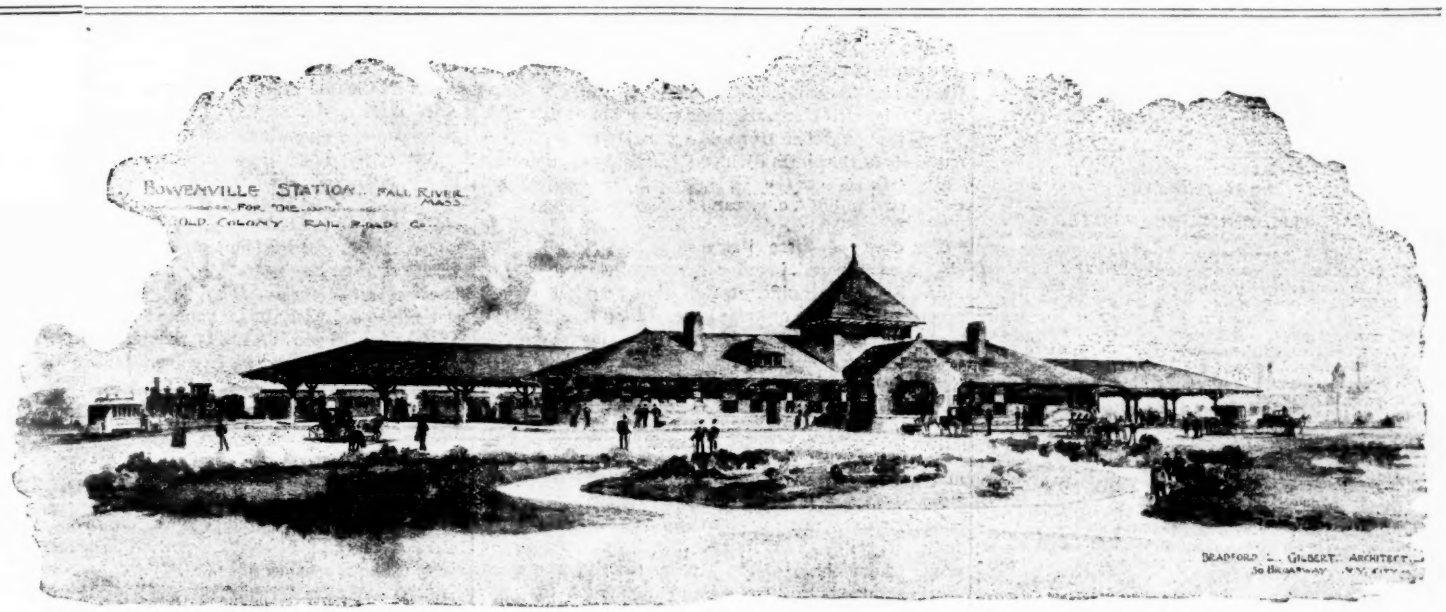
The illustrations printed herewith show a passenger house now in course of construction at the location above indicated. Fall River has a population of about 80,000 and has three stations—Ferry street, the wharf (where the Fall River steamboats land) and Bowenville, about a mile up from the wharf. This latter station has been the site selected for the main Fall River station here illustrated. Allowing the wharf and Ferry street stations to accommodate about half the population, there are still left 40,000 of the well-to-do class to



Floor Plan.

FALL RIVER PASSENGER STATION.

A, Lamp Room; B, Agent's Room; C, Ticket Office; D, Rotunda; E E, Alcove; F, Women's Retiring Room; G, Mail Room; H H H, Arches; J, Drinking Fountain for Horses.



PASSENGER STATION AT BOWENVILLE (FALL RIVER), MASS.—OLD COLONY RAILROAD.

be accommodated at Bowenville. The station is located in the centre of a large square, under the main hill, and in order to break the monotony of the length and the low effect, the sky-line has been broken by carrying up the ticket loggia as a square turret or tower on the street side, the light from the windows overhead being utilized for the ticket loggia. On either side of this ticket loggia is shown on a blank wall space a map of the Old Colony Railroad and connections.

Waiting rooms are provided for men and women, each 40 ft. square, with arched ceilings about 20 ft. in height at the centre. The woodwork of these rooms, including the flooring, and paneled wainscotting 9 ft. high, and columns in the openings, is entirely of oak. No plaster is used anywhere in the building. Two special features have been provided in the general plan—the smoking room, and in the ladies' waiting room several alcoves, with open fireplaces, for the accommodation of private parties. There is also an open fireplace in the men's waiting room. The general effect of the exterior is one of massiveness and solidity and is produced entirely by constructional outlines, no fancy detail or ornamental work being provided anywhere.

The main superstructure is of rock-faced, dark pink, Milford (Mass.) granite, with trimmings, with string courses and vouissoirs of Longmeadow red sandstone. The platforms, together with the floor of the smoking-room, baggage room, trainmen's and hackmen's room, will be of concrete pavement, and the interior walls of all these rooms will be finished in pressed brick (with wooden ceilings), while both toilet rooms will be finished in marble on the floor and 6 ft. in height around the walls.

The roof of the building will be of slate, with a tile cresting and finials as shown. The entire exterior wood work will be of yellow pine, finished in natural color. The platforms are protected by awnings, and space is provided at the south end of the building for a hack-stand, while at the north end a covered space is provided for baggage and express wagons. The building will be completed in July of this year.

Several plans were submitted, that of Mr. Bradford L. Gilbert, of New York City, whose work is well known to our readers, being accepted. With Mr. Gilbert's sketches was submitted a very low approximate estimate based upon actual estimates for other work of this character, but the plans justified the guarantee made with the estimate, and the building proper, exclusive of heating and plumbing, is under contract with responsible parties for less than $40,000, about half the amount of the highest proposal received.

High Steam Pressures in Compound Engines.

Mr. Lencauchez presented a paper on the advantages of high steam pressures in compound engines before the *Société des Ingénieurs Civils* in August, 1890, which is in a measure a reply to Mr. Mallet's recent paper, of which we have already published a summary.

The author says, substantially, that in marine practice, before surface condensers and multiple cylinder engines were introduced, the coal consumption per effective horse power was from 6.6 to 8.8 lbs., with pressures of from 18 to 25 lbs. Now, by means of surface condensers, high pressures and triple and quadruple expansion engines, with the several cranks which are unavoidable, the consumption of coal has been reduced to 2.2 lbs. per effective horse power per hour. But it must not be forgotten that stationary Woolf engines were built in 1855 for which 2.4 lbs. was guaranteed, and that to-day the same makers build engines which use but 17.6 lbs. of water per effective horse power. The great advance in marine engineering has only succeeded in rendering marine engines as economical as simple condensing stationary engines.

For locomotives a large ratio of expansion is only possible by means of the compound system or by a four-valve system of steam distribution. Knowing that for cylinders of the diameter used for locomotives the final effective pressure in the cylinder should be about 7 lbs., in order that the piston may not act as a brake, and that the maximum useful effect is obtained when cutting off at one-eighth of the stroke, the conclusion is that the initial pressure should be 22 × 8 = 176 lbs. absolute. As wire-drawing may cause a loss of from 14 to 23 lbs., the boiler pressure should be about 184 lbs. gauge. But with the ordinary method of steam distribution, when cutting off at one-eighth, the exhaust takes place at about one-half stroke, where the pressure is about 45 lbs., and a considerable loss of work results. With the compound system a large part of this work is utilized, and with the system of distribution having independent exhaust valves it is more completely utilized. For compound locomotives the author allows 7.5 lbs. drop between the cylinders, which, with the necessary final pressure as given above, and a ratio of expansion of 8, necessitates, he says, an initial pressure of about 235 lbs. absolute.

After reciting the now well-known difficulties in connection with the steam distribution in compound locomotives, the author says, in effect, that the partisans of compound locomotives make comparisons between compounds carrying a pressure of 170 lbs. and ordinary locomotives carrying a pressure of 128 lbs., and quite naturally find that the compound is more economical and more powerful in certain cases. The brilliant results obtained in marine practice with surface condensers, high pressures, and the compound system are generally attributed to the compound system alone, so that many people think that they have only to compound locomotives in order to obtain great economy. But practice demonstrates the contrary every day. With the same pressures no advantage is obtained, and with a considerable increase in pressure the compounds give very little saving, perhaps from 2.3 to 5 per cent., rarely 10 per cent., under the most favorable conditions.

Mr. Lencauchez refers to compound locomotives as having four cylinders, and compares them with simple locomotives fitted with the Ten Brinck fire-box, feed water heaters, separate steam and exhaust valves, and steam jackets, and thinks the latter more desirable. "By these simple and cheap improvements the expenditure of a locomotive can be reduced, with equal work, practically one-third or its power may be increased about one-half." The author concludes that the compound principle is applicable to stationary engines such as air compressors and pumping engines, where there is an advantage in having two or three cranks, and where the power and resistance are constant, but elsewhere there is no real use for it. It is a fashion. The compound principle will, at least, have rendered a service to locomotives in raising their pressures from 130 or 140 lbs. to from 185 to 210 lbs.

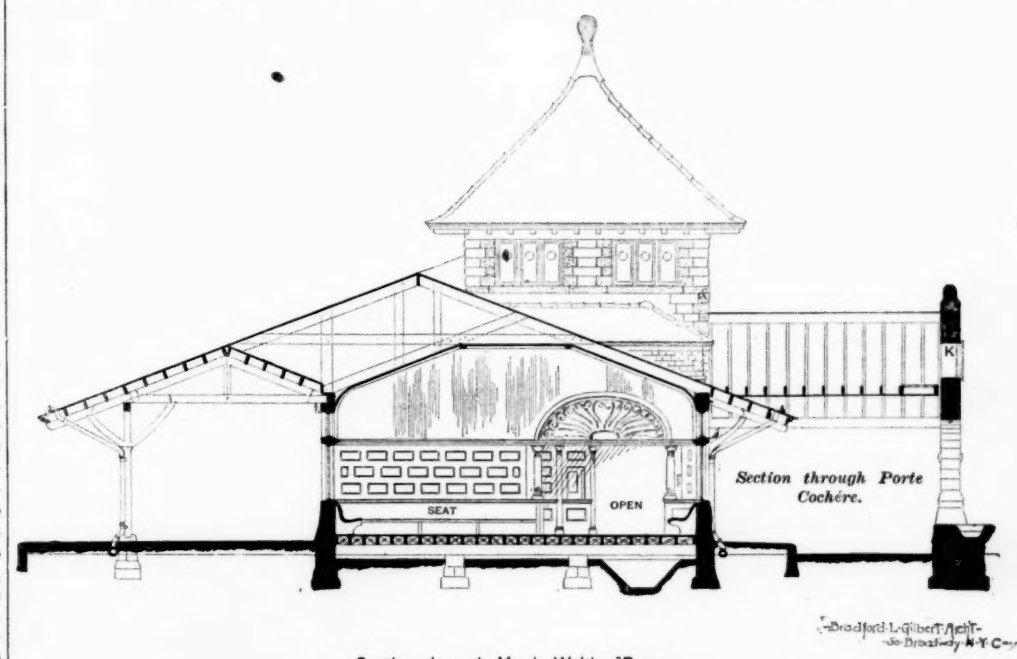
Electricity in Railroad Work.

Mr. P. H. Brangs, Electrician of the Delaware, Lackawana & Western, entertained the railroad men of his own and other roads at the railroad Y. M. C. A. reading rooms at Hoboken, N. J., on the evening of Feb. 18, with an interesting lecture on "The Uses of Electricity as Applied to Railroad Operations." Mr. Brangs gave a full historical sketch of the science, referring to the inventions of Joseph Henry and other pioneers, the early telegraph of Harrison Gray Dyar, and the final triumph of Morse, with various interesting reminiscences. Allusion was made to the first use of telegraph in train dispatching on the Erie in 1851, and to the prominent men who began life in the telegraph service, such as Andrew Carnegie and T. A. Edison. Referring briefly to the first use of the block system between New York and Philadelphia in 1863, Mr. Brangs went on to describe the duplex and quadruplex and then entered upon an elaborate description of automatic block signals. The Hall signal was illustrated by apparatus and drawings. The rapidly extending use of electricity in street car propulsion and the possibility of very high speeds on railroads was set forth, as also the latest inventions in electric welding, etc.

New Machine Shops.

The Chespeake & Ohio has advertised for 1986 cubic yds. of masonry and 6,000,000 brick for construction of its shops and roundhouses at Lewis, near St. Albans, W. Va. Work on these buildings is to commence early in spring.

The Ensign Car Works at Huntington, W. Va., is building an addition to its wheel department, which will double the capacity of the department.



Section through Men's Waiting Room.

FALL RIVER PASSENGER STATION.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

For twenty years this journal has recorded and discussed the suggestions for improvement in methods of reckoning and recording time which have been made during that interval: and, upon looking back, it is evident that a considerable progress has been made. The confusion which prevailed at the beginning of this period has given place to a comparatively simple system, first inaugurated in this country by the action of the railroads. One of the active agencies in the advocacy of these reforms has been the American Society of Civil Engineers, which appointed a Committee on Standard Time about ten years ago. On another page of this issue we print an abstract of the latest report of that committee, which gives information of the progress making in other lands, as also of what must yet be done to perfect our own system in this country. The Society was most fortunate from the beginning of its labors in this field in having for the chairman of its committee Mr. Sanford Fleming, C. M. G., of Ottawa, Canada, whose extensive writings upon the subject have been influential in bringing about whatever action has been taken towards time reform in every part of the globe. Although seeing the end from the beginning, Mr. Fleming has judiciously advocated before the public only the next desirable advance, until that step has been taken. Mr. Fleming and the committee think that we are now on the eve of adopting the "24-hour notation," when we shall be rid of the troubles and confusions arising from the use of a. m. and p. m. Yet "Time that takes survey of all the world" will not rest satisfied with this: we must prepare ourselves to take one more step in order to complete the reforms begun and usher in the universal day. For this, however, reformers may well wait until public opinion shall have caught up with them; it is not, by any means, at present a burning question, but it is a change which will accomplish itself in due time, like the flow of the tide.

As the art of signaling has developed in the United States, a few railroads have placed their signal work in the hands of a separate department, but most roads still depend solely upon the judgment of the signal companies, both for their methods of signaling and for their specifications. Ordinarily the railroad company furnishes to the various signal companies plans of tracks only, with more or less complete information as to the present and probable future train movements. Each signal company then signals the plan and submits a bid for the entire apparatus, according to its own methods. The plans and prices, of course, differ widely, and it becomes difficult for the railroad officer having charge of the matter to decide as to which offer is most acceptable. Usually, too, this railroad officer is fully occupied in his own proper department, and has not, perhaps, so intimate a knowledge of signaling as is desirable, and even necessary. On the other hand, signal companies, operating as they do over a very wide field, can hardly give such attention to the details of each plant proposed as will insure the best and most permanent arrangement. In other words, they are unable to make the necessary study of the ground, and are forced to depend largely upon the track plans provided by the railroads. These changes in plans, which would not have been required if the work had been properly laid out in the first place, often compel the additional expenditure of large sums to correct quite unnecessary errors. Probably much better results could be secured by presenting to the different signal companies for competitive bids completely signaled plans, together with a bill of material. The bids should then be made separately for the different parts of the work, divided somewhat as follows:

1. Tower erected. 2. Machine f. o. b. cars. 3. Material as per bill f. o. b. cars. 4. Labor of putting in place items 2 and 3.

For each of these items complete specifications should be prepared, in order to insure uniformity in the bids. It is a significant fact that formerly bridge specifications were quite as general in form as are the signal specifications of to-day. In the course of a few years it is probable that most of the important railroads will have competent signal departments, but in the meantime a wide and useful field is open to engineers in private practice who have a thorough knowledge of signaling as well as of train movements and of the requirements of maintenance of way.

Besides the Fourth Avenue Tunnel disaster referred to below, we describe in this issue another collision under the block system. An operator's carelessness seems to have been the main, and in one sense the only, cause of the Rahway collision, for if we cannot depend upon a signal man to correctly discern which one of two tracks a train is traveling on, when both are directly in front of his window, we cannot feel any confidence that collisions will not happen any day; but at the same time a more complete signaling apparatus would undoubtedly have prevented this collision. Ordinary bell and telegraph instruments are used for giving and receiving all block signals, messages and other information for all four tracks, and the electrical apparatus contains no permanent visible signal for the operator to refer to. If there had been a separate instrument for each track, connected with the outdoor signals, as in the principal English systems the operator's mistake would doubtless have been revealed at once. The Pennsylvania has long stretches of third and fourth tracks on which, for various reasons, it has not yet adopted the block system, and this accident occurred, we believe, on one of those lines; but as long as operators are stationed along the line to block the trains on the fast tracks, it seems at least questionable not to provide signals and apparatus for all four tracks, even if the blocking on two of them would have to be mostly permissive.

Mr. Blackstone's remarks in his annual reports are always interesting. His political economy is not always sound, and he is liable to make excursions after heresies; but he is never tedious. He has a direct way of speaking, and he talks of the most delicate and distracting problems with an air of candor which pleases, even if it does not always convince. But there are other reasons why people like to read what Mr. Blackstone has to say on the general railroad situation. He is at the head of the most independent railroad in the West. His road is in the hottest of a fierce competition, and still pays eight per cent. dividends, and it dictates terms to roads that operate thousands of miles where it operates hundreds. The Western Traffic Association is practically inoperative until the Alton joins it; but with the Alton it would probably immediately become an actual working organization, controlling the situation. Therefore, while people always like to read Mr. Blackstone's essays, they were especially anxious to know what he had to say in the annual report just issued. In fact, he says little that gives any light on the policy of his road. He says that competition and legal restrictions have led to "strife and desperate measures to secure traffic." His hopes from the agreement to divide traffic were very far from realized. Traffic was diverted by rates so low that for half the year the Alton did not try to meet them. The agreement of July was entered into with reluctance but as a duty, with the hope of arresting the prevailing demoralization. But it is impossible for the law-abiding to compete successfully with those who violate the law. Mr. Blackstone then develops at some length the idea that the power of the state to control rates carries the reciprocal duty to protect railroad property: and that our part of this duty is to control building so far as to prevent unnecessary lines, which not only divide the traffic, but increase the relative cost of service. All of these are matters of deep importance, and which not only the Alton stockholders but the general public should consider seriously and often: but they give us no clue to the Alton's attitude toward the Western Traffic Association. From other sources, however, we are able to judge of that. Probably the Alton would go into the Association to-day if it felt reasonably certain that the Atchison would act in good faith. On the other hand, the latest indications are that the Atchison people are determined to control their allies and their own agents and live up to the agreement. May we not hope, therefore, that the Alton will now see its way into the fold? If it could, and if the Association could be made actually operative, much of Mr. Blackstone's last essay would lose its significance.

Rail Sections.

We gave last week the Progress Report of the Committee on Standard Rail Sections of the American Society of Civil Engineers. The reader who examined the sheet of sections and the tabulated data must have been impressed with the fact that the type of section, for the next decade at least, is practically established. That is, the rail head will have vertical sides, a long crown radius and short corner radii, will be broad and thin, and will contain something like 40 per cent. of the total metal. This is what opinion has been gradually settling down to for some time. The theory of a deep, heavy head still has its advocates, but we hear little from them now—so of the advocates of the flaring sides. The older ideas still predominate in the section books of the rail mills, but the newer ones are seen in most of the recent sections.

In the committee's report there is but one set of sections out of 10 submitted in which the older theories are not squarely abandoned. In that set the percentage of metal in the head runs from 42.20 for the 40-lb. rail up to 49.70 for the 100-lb., the average being 46.1 per cent. In one other set of sections the percentage of metal in the head runs up to 46.2, and averages 44.6. In another the highest is 45.3 and averages 44.5. The other seven sets of sections show the metal in the head running from 38.7 per cent. to 44.3; and of these there are but 10 sections out of 49 in which the percentage of metal in the head reaches 43. The average of all 10 sets of sections is 42.49 per cent. in the head; leaving out the Bouscaren, Goodwin-Rea and Rodd sections, the average of the remaining seven sets is 41.4 per cent. This is an immense change from the proportions which were generally adopted a few years ago and are still generally rolled. But the committee has, we believe, expressed in this feature of the sections the present ideas of the majority of rail makers and of those railroad engineers who have given this matter especial study.

The influences which have been working to convince people that they were putting too much metal in the rail heads and making the heads too deep are probably pretty well known to the readers of the *Railroad Gazette*, but it is only fair to mention some of the men who have done most to create the opinion which has been focused in this report and which will, without any doubt, give direction to rail practice for some years to come. Mr. Hawk, of the committee, should, perhaps, be mentioned first, as he was not only one of the first to see the mistake that had been made in abandoning the thin heads of the earliest steel rails, but he was one of the first to get his ideas into service in the shape of rails. Captain Hunt, of the committee, has also been an influential writer in the same direction. The series of sections proposed by him early in 1889 (*Railroad Gazette*, June 7, 1889) was the same as that now presented as a member of the committee, except that it was a series for each 5 lbs. from 60 to 90 lbs. That series was the result of his observations and experience for some years, and really should date back earlier than 1889. Captain Hunt acknowledges his indebtedness to Mr. Hawks, and also to the still earlier investigations of Mr. P. H. Dudley, who designed the New York Central 80-lb. rail in 1883. That, as is well known, has a broad and comparatively thin head, and was a radical change from the sections in vogue when it was made. The distribution of the area of cross-section is (about), head, 44 per cent.; neck, 19; flange, 37. Recently (*Railroad Gazette*, Aug. 15, 1890) Mr. Dudley has put out a carefully studied series of sections varying by 5 lbs. from 50 up to 105 lbs. These sections are worth the serious attention of any one who aspires to design a standard series. The studies and writings of Mr. F. A. Delano of the Burlington have also had an important influence in establishing the most important idea which finds place in the report now published. Mr. E. C. Potter also has done valuable work in the same direction, and his position enabled him to get his sections into actual use on several roads in 1888 and 1889. Finally, the American Society's Committee on the Relations of Wheel and Rail Sections last year formulated its recommendation of a head "broad relatively to the depth."

The part that the *Railroad Gazette* has taken in all this will be remembered by those who have been interested in the subject. For the last four or five years we have not ceased to advocate the essential idea which will, as we have said above,

characterize the type of rail section that will prevail for some years to come. Whether or not the American Society of Civil Engineers shall produce and recommend a series of standard sections, or whether or not it ought to do so, are questions entirely apart from this of the fundamental principles of the proportions of the section. But this report alone, regardless of any further action, will be of great effect in establishing something like standard practice.

The Fourth Avenue Collision.

The rear collision in the Fourth avenue tunnel, New York City, last week, described in another column, is of special interest to all railroad men because it occurred on a piece of road which is provided with more elaborate safeguards than almost any other line in this country, and which is operated under very strict rules.* The Grand Central Station officers justly pride themselves on having the most inflexible application of block-signaling rules in the country. There are numerous empty engines and trains of empty cars passing over the line, but there is no permissive blocking either in the tunnel or on the lines outside the tunnel for 10 miles or more from the Grand Central Station. The Sykes locks are in use on all signals and are rigidly maintained. In addition to these, the blocks which lie within the tunnel are equipped with track circuits their whole length, by means of which each operator has constantly before him a disc indicator showing whether or not each block under his charge is occupied; and, finally, the company has within the last year equipped each home signal with the Kelsey audible signal, described in the *Railroad Gazette* of June 27, 1890. This being the case, where is the fault in the system, who is responsible for the six deaths, what shall be done to make running trains through this tunnel safer, and how shall the demands of the press and the public be met?

Dropping for a moment the question of immediate responsibility—whether the engineer or the signalman made a mistake, what can the railroad company do? In the first place, practically all experienced railroad officers will probably set aside as unavailable the scheme, so persistently presented in various quarters, of lighting the tunnel. Though a large portion of this two-mile tunnel is about the same as an open cut, the very numerous street crossings all have wide bridges, and the exclusion of daylight as well as the confinement of smoke and steam will have to be considered on practically about the same basis as though a simple tunnel were being considered. This being the case, no amount of light will cure the trouble as long as the engines emit smoke and steam. The use of anthracite coal or coke would abolish most of the smoke: but aside from the greater cost of operation, this remedy would still leave us without any way of getting rid of the steam. There are heavy grades in this tunnel, and the engines have to be worked to their full capacity: the volume of steam emitted, especially in cold weather when the condensation by the atmosphere is at its maximum, is, therefore, greater than any feasible system of ventilation could promptly dispose of.

AUDIBLE SIGNALS.

As long as tunnel railroads are operated with steam locomotives a system of audible signals of some kind seems to be the only effectual method by which trains can be run close together, at high speed, with safety We believe it is freely admitted that the audible signal now used in the Fourth avenue tunnel is somewhat of an experiment. None of the rules requiring the sharpest lookout for visual signals have been relaxed, and, in point of fact, the frequent slackening of speed necessitated by the inability of engineers to see the visual signals as promptly as could be desired has continued since the introduction of the audible signals the same as before. The signal used consists of a large gong fixed to the side wall of the tunnel and connected by a vertical rod with a track lever, which, depressed by each passing wheel, strikes a hammer against the gong. When the visual signal is pulled to the safety position its movement disconnects the hammer and allows the track lever to be operated without ringing the gong. The noise made by a train running through this tunnel is, however, a hard condition to be contended with. The frequent openings, the reverberations caused by the openings from the two-track central tunnel to the single-track side tunnels, and, above all, the combination produced when two or more trains pass each other in the tunnel, make a racket which is rarely paralleled. The size of the gong used has been increased twice, but yet it is unsatisfactory. The track lever, rod and other apparatus make considerable noise when operated, even when the gong is disconnected, and the higher the speed of a passing train the greater is this noise. The difference between the impression made on an engineer's mind by a danger signal and by the rattling of the apparatus when the signal is in the all-clear position is therefore not so great as could be desired, and it is conceivable that engineer Fowler assumed that the audible signal gave him a right to proceed, when in point of fact it did not.

We understand that the torpedo signal in use on the New York elevated lines has been tried in this tunnel and been discarded because the torpedo holder suffered damage or destruction from driving wheel tires which had been worn hollow. But as the use of hollow tires is bad practice in any case, as hollow-wearing can be prevented by using the Ross type of brake shoe, and as the testimony of the Manhattan officers, with other evidence, tends strongly to show the torpedo to be a more effective signal than the mechanical gong, the failure to further try the torpedo would seem to have become, in the light of the present event, a grave mistake. We have never heard that a torpedo explosion was ineffective as a stop signal, even in the noisiest situations.

Railroad men are familiar with a system of audible signals described in the publications of the Union Switch & Signal Co. This is a very simple device and was invented long ago, but has not come into use because of certain objections to it, which have been justly regarded as serious. It consists essentially of a lever attached to the top of the locomotive cab, which, when it comes in contact with an arm extending from a signal post, opens a whistle valve in the cab or applies the air brake. The arm extending from the signal post is drawn up out of the way whenever the signal is pulled to the all-clear position. The first practical objection to this system is that every engine on a road must be equipped with the apparatus, even if it pass such a signal post only once a year. The expense of fitting up all the signals on a line would be regarded as unnecessary, and the liability of an engine not equipped passing a signal where dependence was placed on the audible feature would be a constant element of danger. The principle that a safety signal should be positive, and not merely the absence of a sight or sound, is also unfulfilled in this invention (as well as in torpedo signals). An audible signal which shall give a positive indication of safety must sound often enough to permit the engineer to readily judge, by the intervals of *time* between signal posts, whether he has passed a signal which has failed to act. Such a signal is by no means an impossibility, and it may become a necessity.

VARIOUS CRITICISMS.

There has been discussion of various questions which seem to have arisen from lack of acquaintance with the facts. The sending of the train of empty cars ahead of a regular passenger train is not to be criticised when it is remembered that the absolute block system is used, and scores of such trains have to be run every day. If a block system cannot protect all trains, at any speed, railroading may as well be given up. To make one block of the whole tunnel, keeping trains two miles apart, is not to be thought of when the great volume of traffic here concentrated is considered. If trains cannot safely be run over this road at intervals of half a mile, it were better to buy up the streets and make an open cut. Running the trains on the left-hand track brings the signals on the left of the engine, while the engineer rides on the right. This is certainly not the most desirable practice, but the rule requiring both enginemen and firemen to observe all fixed signals and in each case communicate with each other, seems to provide such a satisfactory safeguard as to render criticism at least difficult, if not unreasonable. This rule of joint responsibility is not formally in force; but the reports indicate that the engineer and fireman made some pretence of carrying it out in this case. Some of the visual signals have sometimes to be used as daylight signals, and their size and shape may perhaps be criticised. They certainly are not so good as a semaphore, and, depending on color, it is essential that every engineer and fireman be tested for color blindness. But with a complete system of distant signals in use, we are not disposed to say that the 8 × 15 disc presented by the lamps is an insufficient visual signal.

The futility of trying to protect trains, where the traffic is dense, by the usual flagging rules, to be carried out by the rear brakeman, is vividly illustrated in this case. The train of empty cars had not been stopped at Eighty-sixth street, as the first accounts indicated, and therefore the rear brakeman had had no occasion to go back. The utter impracticability of enforcing such a rule as No. 99 of the Standard Code is illustrated on the Fourth avenue line every day. Brakemen are going back continually, and if they go every time the rule requires, a half a dozen men at least would be needed on each train. But in nearly every case they come in before the train gets away from them and resume their place on the rear platform. Block systems must be sufficient in themselves, not depending on the partial support of the time interval system.

TRAIN HEATING.

The fire which so quickly burned up a large portion of the wreck justly furnishes the chief text for the criticisms of the daily press. The New York, New Haven & Hartford, which is responsible for the lighting or heating apparatus which undoubtedly caused this fire,* has been found guilty of violation of the New York State law, and it is now contesting in the courts a sentence against it imposing a heavy fine. The company has persistently opposed all continuous systems on the plea, if we are to believe common report, that the president of the company fears that some passenger or passengers will some time be seriously scalded by the steam systems. There is little use in discussing the question at this late day, and it must be regarded as settled that public opinion will enforce the use of continuous systems, in spite of all mechanical or minor difficulties, or any question of expense. That the New York, New Haven & Hartford has receded from its radical position is, however, indicated by the fact that the 50 cars which it has ordered for the new suburban service on the Harlem River Branch, in connection with the Manhattan Elevated, are to be heated by the Gold continuous system, and the more significant statement that an order was given the Consolidated Car Heating Company two days before this collision. The report of General Manager Platt cautiously stated that the fire may have started from the heater or lamps in the cars, or the headlight of the locomotive; but the question is immaterial. The tail light of the New Haven train was extinguished by the shock of the collision, and quite likely the other lamps behaved in the same way.

WHO MADE THE MISTAKE?

The conflicting statements of the witnesses make it impossible as yet to say whether the home signal at Seventy-second street showed red or white, and it may require very careful investigation to show which side is right and which is mistaken or dishonest, though the information thus far given strongly favors the signalman. Numerous similar collisions have occurred in England and the circumstances attending them have sometimes been such that the expert government inspectors could arrive at no positive conclusion as to which of two stories was the truth; and we may have such a case here. But the duty of the railroad company is plain. Aside from the question of heating apparatus, the officers have been moving in the right direction and have, indeed, operated a difficult piece of road with a high degree of success. Probably no one needs to tell them that, though moving in the right direction, they must now move faster. Smokeless coal, steam condensing apparatus, and electric lights to dazzle the engineers' eyes are either impracticable or of doubtful value; but the improvement of the audible signal system is a field in which immediate action can be taken. Further, the final sifting of the testimony will probably show either the necessity of more rigid rules for the operation of the Sykes system or the need of more explicit or better enforced rules for enginemen. If we admit that Engineer Fowler is right, it must still be held desirable that engineers and firemen shall follow such a routine that in a case like this they can give strong and circumstantial evidence that they both took cognizance of each and every signal.

*Perhaps the only American roads that can be fairly compared with this are the busier portions of the Pennsylvania and the lines of the Manhattan Elevated. The practice of the latter throws no special light on the Fourth Avenue case, except that audible signals, for giving a warning auxiliary to that afforded by visual signals, are in extensive use on the Elevated. The only block system in use on the Elevated is Black's mechanical system, and the audible signal, which, as most of our readers know, is the Palmer torpedo attachment, is used principally at junctions and switches. There is a large number of these torpedo signals in use, and the officers of the road express a high degree of satisfaction with them. The chief criticism we have heard in connection with their use is the danger of breakage of the apparatus by worn driving wheel tires, which, if they are hollow enough to extend much below the top of the rail on the outside, may break the torpedo attachment; but the Manhattan road has no trouble on this score. The Pennsylvania has no important tunnel on its busy Eastern lines, and its most complicated problems in signaling doubtless are found on the line entering Broad street station, Philadelphia. Here there is much switching and a great many movements by trains other than regular passenger trains, and we understand that permissive blocking is not entirely prohibited.

Ten Years of Prussian Railroad Management.

The Prussian authorities have recently published a table showing the progress which has been made in railroad service in that country in the last ten years—the decade which has elapsed since the acquisition of most of the railroads by the government. The comparison is made between the whole government system in 1890 and the corresponding systems of roads in 1880, whether owned at that time by the government or by private corporations. In this time the mileage has increased 22 per cent., the number of stations 40 per cent. The number of locomo-

*The cars were owned by the Boston & Albany, but that company uses a continuous system except on the cars which are used jointly with the New York road.

tives has increased 27 per cent., of passenger cars, 35 per cent., and of freight cars, 30 per cent. It will be seen from this that there has been a decided increase in equipment per mile. Still more marked is the improvement in amount of service. The mileage run by locomotives has increased 60 per cent., which means an increase of more than one-quarter in the amount of use made of each locomotive. The use of each passenger car has increased, on an average, 37 per cent., and of each freight car 21 per cent. The passenger mileage has increased 77 per cent.; the ton mileage, 79 per cent. The average receipts per passenger mile have diminished 12 per cent., and per ton mile 11 per cent., leaving a net gain from each branch of the traffic of more than 50 per cent. in gross earnings, although the rates were about one-eighth lower than before.

If we compare these results with those which have been attained in the United States, we find that the train mileage and train service is even now much less than ours in proportion to the population. Although the train mileage in Germany has increased from 74,000,000 to 118,000,000, it is away behind the American figure of 724,000,000. So, also, passenger and ton mileage is proportionately less than ours, being 4,400,000,000 passenger miles and 9,900,000,000 ton miles in Germany, against 12,000,000,000 passenger miles and 68,600,000,000 ton miles in the United States. The figures of traffic economy do not differ so widely from ours. The average annual mileage run per freight car is 11,000, per passenger car, 27,000. The average locomotive mileage is 14,000 as against about 30,000 in the United States.

Perhaps the most marked point of contrast is in the increase of gross earnings per mile of more than 25 per cent. in Prussia, while those in the United States have shown a tendency to diminish rather than to increase. This is due, first, to the fact that the Prussian Government, having a monopoly of the railroads throughout the country, has not built unnecessary lines, most of the new mileage of the last ten years being comparatively small branch lines, often built at a low cost per mile, and serving as feeders for the larger systems instead of competitors for traffic already existing; second, to the fact that the reduction of rates in Germany has been very much less than in the United States. It is impossible to say accurately what were the average receipts per ton per mile, or per passenger per mile, in America in 1880, but it is almost certain that the decade has witnessed a reduction of something like one-third in this country in freight rates and one-fifth in passenger rates, against one-eighth in Germany. Monopoly has not prevented this reduction, but it has prevented it from keeping pace with possible economy in operation, so that the railroads have made an increased profit from the traffic which they had instead of a diminished profit. The relation between German and American rates as they exist at present will be seen from the following table:

	Prussia.		United States.	
Cents per mile:	1880.	1890.	1882.	1889.
Passenger	1.41	1.24	2.51	2.17
Ton	1.72	1.52	1.24	0.98

While their passenger rates are much lower than ours, their freight rates, in spite of the reductions that they have made, are still decidedly higher, and the difference to-day is greater than it was ten years ago, instead of less.

A good deal of the progress here shown has been made in the last two years. The advent of the new monarch to the throne has been marked by increased activity in railroad service as well as everywhere else. In a state railroad administration under a centralized monarchical government, the character of the ruler makes itself felt throughout the whole civil service, industrial as well as military or judicial. What has been accomplished in Prussia during these two years is in the highest degree creditable to the head of the state. How long the same process can go on remains to be seen. It may be that it is simply an instance where a new broom sweeps clean, or it may be that it will last for some time to come. In the latter case the Prussian railroad service will be far the best on the continent of Europe.

With singular fitness Chicago is now the seat of the principal air ship, or flying machine, industry of the world. It is there that one can see every day for a quarter of a dollar the latest "air ship." It is there also, we believe, that for a larger amount of good money one can buy handsome certificates stating that he owns more or less of the stock of the company which has built and is trying to float this air ship. A contemporary takes the Chicago air ship seriously, and proves that is only a crude device of some one who knows little of the science of flying; at the same time our contemporary "regrets to even appear to throw cold water upon any honest attempt to solve the problem of flying." Now, if the editor really wants to solve that problem we will give him a pointer. Let him take a sitting in any orthodox church, and listen every Sunday, with a meek spirit and a contrite heart, to what goes on there. We venture to say that he will get a new light on the problem, which will be useful to him hereafter if not here.

The second screw ferryboat has just been put in service in the waters of New York harbor. It is the "McCullough," of the Erie, running between Jersey City and Twenty third street, New York. We described this craft some months ago. She has a screw at each end and compound engines. She is fitted with steam steering gear and lighted by electricity. The "Bergen," of the Delaware, Lackawanna & Western, was put in service a year or more ago, and has been running successfully. She has triple-expansion engines. With about the same economy and efficiency screw ferryboats should fast replace side wheelers because of the greater deck space. If they prove to be more economical also, so much the better.

Early German Studies of American Railroads.

II.—GERSTNER'S STUDIES IN 1839.

The European continent naturally looked first for practical knowledge of the construction and working of railroads to England; but, in Germany especially, the great cost of lines built after the English standards was felt to be an insurmountable obstacle to the construction of anything more than a few lines, and, in fact, with the exception of a line four miles long between Nuremberg and Fürth, no railroad was completed in Germany until nine years after the opening of the Liverpool & Manchester line. When it became known, therefore, that in America lines were built for a small part of the cost of English railroads of the same length, and that, however imperfect, they were still found to be immensely superior to other means of transportation, the Germans naturally were anxious to know whether the methods which enabled the Americans to build so cheaply were applicable in their own country.

That there was a belief that American methods of construction would be useful in that country is indicated by the title of a work on railroad construction published in Vienna at least as early as 1842, in which the author describes himself as a "North American Railroad Engineer."*

The earliest elaborate European study of American railroads and canals, however (so far as we know), was undertaken by an Austrian engineer, the Chevalier Franz Anton von Gerstner, who in 1824 had constructed the first steam railroad on the European continent, the before-mentioned short line between Nuremberg and Fürth, and in 1838 completed the first railroad in Russia.

At this latter date the first important German railroad, the Leipsic & Dresden, was not yet quite completed; but the country had at last become convinced of the importance of the new method of transportation, many lines were projected, and it seemed probable that a great deal of railroad construction would soon be undertaken in Germany and Austria. In this country there was then already what seemed to Europeans an enormous system of canals and railroads; in fact, only here and in England had there been any considerable experience in the construction and operation of railroads which could be utilized in planning and executing the German system, the time for which seemed to have arrived. As one of Gerstner's associates wrote: "For such experience, where with better result could we turn than to North America? From the Canadian border to the Gulf of Mexico, from the Atlantic coast to the distant, but still thickly peopled region of the West, we see a system of canals and railroads extending, by which all important points in the country are already connected with each other."

To study what was then, as it is now, the most extensive railroad system in the world, Gerstner, in company with an engineer who had been employed under him in Russia, Mr. L. Klein, visited this country, arriving in November, 1838. He remained here twelve months, and traveled over nearly all the railroads then completed or begun, and obtained, usually, full information as to their construction, rolling stock and methods of working, and also made a special study of the canals of the country. He intended to publish the results of his observations in English as well as in German, but only a few months after his return to Europe he died (in April, 1840).

What progress he had made in the preparation of the volumes published two and three years later under his name those volumes do not inform us. His associate, Mr. Klein, who had assisted him in collecting the materials for the work, and visited the railroads and canals with him, after his death completed it; and he probably wrote nearly all of it. The first volume was published in Vienna in 1842, and the second and concluding volume in the following year.†

In the preface Klein sets forth that there were then (in 1840) 178 different railroads in the United States completed or under construction, with an aggregate length of 9,400 miles, and that 5,262 miles of canal had been completed or begun. Each one of these railroads is described in detail—often with a great deal of detail—down to the number of men employed, with the wages of each. Owing to the importance of the Erie Canal, the great success of which had had an immense effect in stimulating other internal improvements, that great work is described "with all detail," it with the other New York canals occupying nearly one-fourth of the first volume.

The leading place occupied by New York in internal transportation may be estimated from the fact that two-thirds of the volume is devoted to its canals and railroads; this, however, is not only because it had the largest system, but also because it had one of the oldest systems; and as the results of operation are usually given for every year of a railroad's existence, and its various experiences noted, the longer its life the longer its history.

Thus the ancient Mohawk & Hudson Railroad, which had reached the ripe age of eight years, requires for its treatment no less than 16 pages, or nearly a page for every mile of road. This, being a pioneer railroad, had had to pay a good deal for experience. It had cost, with a double track, $63,568 per mile, or about 3½ times the average cost of the New York railroads. It was built for passenger traffic, and had been very successful in securing a large amount. A little freight was carried, but the amount averaged only 15,200 lbs. per train (there were no freight trains), and it was believed to be unprofitable, so that the question of giving it up altogether had been seriously considered. The average receipt per ton per mile was only 5½ cents. In 1839 the company had on its 18 miles between Albany and Schenectady 4 locomotives, 48 passenger cars and 100 freight and baggage cars. Three of its engines were built by Robert Stevenson. The "John Bull," of which we have heard so much, was wholly rebuilt by the railroad company, and its fourth engine was built in its own shops. These little engines, weighing 12,000 lbs., cost $7,000, about as much as big ones cost now.

The information concerning the officers and employés on this and other roads is often very interesting. The force employed for the maintenance of the 18 miles of the Mohawk & Hudson Railroad consisted of a Superintendent of Repairs at $2.25 per day, a Superintendent of Laborers at $1.50 per day, eight carpenters at $1.25 per day, and six laborers at 75 cents per day, besides a laborer for each mile, whose duty was to keep the wedges driven tight which keyed into cross ties the longitudinal timber bearing the flat rails, and to keep the turf in order on the slopes, the embankment being sodded to within 3 ft. of the rails, to keep the sand, of which they were formed, from washing down. This force, however, was only employed from April 1 to Dec. 1. No one was regularly employed during the winter in maintaining the road, only in exceptional cases a few men were engaged temporarily. The Superintendent of the road remarked to our author that the employés engaged in summer all lived close to the road, and took such an interest in it that they sometimes looked after matters and gave assistance in winter without pay. (We fear that in these days a railroad which depended upon the gratuitous assistance of the men it had turned out in the cold for the winter would not be kept in very good condition.)

In the transportation department of this road the force consisted of a shop superintendent at $800 a year, a foreman of smith shop at $2 per day, a foreman of carpenter shop at $1.75 per day, three locomotive enginemen (who did the repairing also) at $2.37½ per day, and three firemen at $1.12½ per day. In the shops were employed two machinists with three apprentices, four blacksmiths, and three carpenters with one apprentice. They were paid $1 to $1.50 per day. There was a "Collector" in Albany and one at Schenectady, costing $800 each, and the President and Secretary, who seems to have been General Manager, got a salary of $2,000.

On the Saratoga & Schenectady Railroad, which did what was thought to be a thriving business in summer, the locomotives were laid up in winter and horses used instead; and that seems to have been the ordinary practice on several lines further west. When the snow lay very deep in long and deep cuts, the passengers were carried in ordinary sleighs. The sleighing had lasted as long as six or eight weeks in a single winter. From July 1 to Sept. 1 there were three trains each way daily; during the three fall months there were two; from Dec. 1 to April 1 only one, and for the following three months two again. For the 29 miles between Schenectady and Sara-

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* The writer has so far not been able to find a copy of this book. In a volume published in Vienna in 1842 it is advertised as follows:

ZIMPEL (Nordamerikanischer Eisenbahn-Ober-Ingenieur).—Das Eisenbahnbauwesen praktisch und populär dargestellt. Qr. 8vo. Mit feinem Atlas von 8 Tafeln in Plano. Geheftet, 6 fl. C. M.—L. Förster's artistischer Anstalt in Wien.

† Die inneren Communicationen der Vereinigten Staaten von Nordamerika, von Franz Anton Ritter von Gerstner, Landstand im Königreich Böhmen, emer. Professor der Mathematik am k. k. Polytechnischen Institut in Wien, Mitgliedmehrerer gelehrter Gesellschaften. Nach seinem Tode aufgesetzt, redigirt und herausgegeben von L. Klein, Civil Ingenieur. Erster Band, mit 15 Tafeln Zeichnungen nebst einer Canal und Eisenbahn-Karte der Vereinigten Staaten. 376s. 1842. Zweiter Band, mit 19 Tafeln Zeichnungen. 339s. 1843. Wein, L. Förster's artistische Anstalt.

[The Internal Communications of the United States of North America, by Chevalier Franz Anton von Gerstner, Landstand in the Kingdom of Bohemia, emeritus Professor of Mathematics at the Imperial Royal Polytechnic Institute of Vienna, member of several learned societies. After his death composed, revised and published by L Klein, Civil Engineer. Vol. I., with 15 plates and a canal and railroad map of the United States, 376 pp., 1842; Vol. II., with 19 plates, 339 pp, 1843. Vienna, L. Förster's Art Publishing House.]

toga the fare was at first and till 1837 $1; afterwards, $1.25. From Albany to Saratoga the through fare was $1.75, the Mohawk & Hudson getting 62½ cents and the Saratoga & Schenectady $1.12½. There was competition here, for the Troy & Ballston line (Rensselaer & Saratoga Railroad) connected with the Saratoga & Schenectady at Ballston, and ran its own cars through from Troy to Saratoga, charging $1.50, against $1.75 from Albany via Schenectady. The Saratoga & Schenectady company naturally preferred the route which used the whole of its line to the one which used only a small part of it, and though the Troy & Ballston got its cars hauled through from Ballston to Saratoga, it had to pay the Saratoga company 50 cents for every passenger in them, though the latter company's regular fare in its own cars between the same places was only 37½ cents. The freight rates between Schenectady and Saratoga were $1.50 for a cord of fire wood, three cents per bushel for oats and six cents for wheat or rye and 18¾ cents for a barrel of flour, $1.25 per ton for coal or plaster, $2 per ton for merchandise. The average was about 6½ cents per ton per mile. Taking the year round, the average train load was about 25 passengers and 2.9 tons of freight.

The road was divided for maintenance into four sectioions, for each of which there were a carpenter and two laborers and one horse. These were all discharged Dec. 1. Then, if the drivers noticed anything wrong as they passed over the road, they notified the Superintendent, and he sent out a laborer to make it right. A car drawn by horses was used for this work. Until 1839 the repairs of rolling stock of this road were done in the Mohawk & Hudson shops. It had just opened shops of its own, and had a Master Mechanic at $800 per year. Enginemen were paid $1.75 per day when they made two trips and $2 when they made three trips (each 29 miles) per day. The fireman had a dollar a day. The train conductor acted also as baggageman and brakeman. The Superintendent had a salary of $1,250 per year. The "collector" in Saratoga, who was agent for all three of the roads, acted both as ticket and freight agent for $600 a year. Three other men were employed at the Saratoga station on wages of from $25 to $30 per month. "They have to do all the work required for the passengers, load and unload freight handle the cars, pump water for the locomotives, and take care of the horses at the station." And it does not seem that the author exaggerates when he observes that "the management of this road is perhaps cheaper than than any other."

Wrecking Outfits and Handling Wrecks.*

BY P. W. HYNES, WRECKING FOREMAN B., C. R. & N. R. R.

VII.—CLEARING AND PICKING UP FREIGHT WRECKS.

In my last paper the subject of Clearing Track was treated in a general way only, and now I wish to mention a few particular operations in the same connection before passing to the subject proper of this article.

We have a loaded box car lying on its sills, minus the trucks and nearly in line with the track. Let the track be laid up to the car and the front end lifted with the derrick high enough to admit of leveling off the ground. Then place ties at intervals under the car, and upon these lay two rails, well greased, to act as skids. Upon these rails a tie should be laid across at each end of the car, and upon these ties the car will rest, a firm bearing being given by wedges. The car may then be drawn for some distance without injury. If the car be a large one, it may be necessary to transfer part of the load. In the case of a loaded car lying across the track, the freight should be transferred at once and the car can then be readily handled.

It frequently happens that cars will be piled up clear of the track but supported by one car, which must be removed in order to open a passageway. When the removal of this supporting car would cause the pile to fall on to the track, it is sometimes possible to cut it in two, leaving the supporting part under the wreckage and ditching the remainder. In such a case, however, the pile should be supported by blocking, unless perfectly secure without it. Having drawn a car out of the wreck on skids and wishing to ditch it, take a pull on the outside bolster, on the side near the ditch, with a short switch rope. This will tend to throw the front end away from the ditch and the rear end towards it. By the use of blocking and wedges, the rear end may be helped around to the edge of the bank, and then the front end can be lifted out by the derrick. Then place the point of the derrick hook under the side sill and roll the car till it is nearly over. At this point the derrick should be disconnected, to guard against accident should the hook catch. The weight being held by the winch brake, let the derrick be moved forward, and the jib, swinging out, will tip the car over the bank.

Car trucks often do great damage when carelessly dragged over the track. They may be made to run true by using the double chain hooks. These are made of two pieces of ¾-in. chain, each having a hook at its end, and the two being joined by a ring to which the hauling power is attached.

The track being clear for passage of trains, we turn our attention to picking up the wreckage. All useless woodwork should be burned on the ground and the scrap iron carefully gathered. But no articles should be destroyed until their condition has been passed upon by some authorized person.

* Copyright 1830, by P. W. Hynes.

Car bodies lying on their sides may be hauled up alongside the track, and then rolled over so as to lie upon the rails on their sills. They may then be placed upon trucks or loaded upon flat cars as follows: When a car is to be mounted upon trucks, let a pair of trucks be placed upon the track by the derrick and run past the disabled car. In lowering the truck to the rails see that the brasses and caps are in place before putting the weight on the axles. The car being hauled into position lying on its side, with the side-sill 1 ft. from the rail, place two ties across the track on the rails to protect the brake rods, etc. Two other ties should be laid under the car to prevent its sinking into the ballast when rolled over. Place the derrick hook under the end post and turn the body over so that it will lie upon the sills on the track, and parallel to the rails. Now attach the derrick hook to the draw-head and lift the front end high enough to admit the "horse and saddle," previously described as being a strong oak horse, the four legs of which stand upon the rails; the saddle being an oak crosspiece which receives the weight of the car, and, resting on a swivel, acts as a turntable. Pass the horse back to a point slightly in the rear of the car centre. Then, by dropping the front end, the rear end may be raised, when, the truck being run into position, the car may be swung to one side or the other and secured in place. Next remove the horse and mount the forward trucks.

When cars are fitted with air brakes great care is required in blocking, so as to avoid damaging this apparatus, and it is often better to remove the parts. When this is done they should always be placed inside the car from which they are taken. If a box car lies in the ditch on its sills it may be placed on the rails by lifting the rear end and then the front, swinging each in in turn; or it may be tipped on to its side and rolled up, as already described. Flat cars and gondolas may usually be handled in the former way and can be placed upon trucks without the use of the horse.

When placing a disabled car body upon a flat car the horse is used and the end of the flat car is introduced instead of a rear truck. The body is then shoved back upon "dollies." Cars lying at the foot of a high embankment may be brought to the track by pulling each end alternately, tackles being used to hold what has been gained at one end while pulling at the other. With very heavy cars, however, it will be found necessary to block up level before swinging them in over the rails, and this operation requires great care.

The subject of transferring freight is too important to pass without some notice. If the damaged cars lie on a level with the track, or nearly so, it is generally a question of carrying by hand. Heavy articles may require the use of the derrick, and grain or produce in bulk may be transferred in canvas bags or baskets, preferably the former, a stock of which should always be carried in the caboose. When the freight lies at the foot of a bank it is better to use an improvised derrick and operate it by the engine. Let a light spar be lashed to the jib of the wrecking derrick so as to carry a single 8-in. block in such a position as to be plumb over the centre of the door of a box car which is coupled to the derrick car. Rig a light tackle from this block and pass the hauling line to the engine. To the hook of the lower block all sorts of freight may be attached by slings or in barrels carried upright in lashings. This arrangement need not interfere with the use of the derrick at any time in the ordinary way when more important work is ready for it.

Argentine Railroads.

BY G. C. MUELLER, C. E.

The most extensive network of railroads in any one of the South American Republics is to be found in the Argentine Republic. Especially in the last decade many new lines have been built and existing ones extended. The oldest system is the Provincial or Western Railroad. Numerous lines run from the capital through the fertile districts of the province, the longest line being to Trenque Lanquen, 440 kilometres. The whole system is about 1,000 kilometres in length. This line was built, and until recently operated by the Provincial Government, when it passed into the hands of an English syndicate.

The most important system is the Southern. From its palatial station on Plaza Constitucion, in Buenos Ayres, its main line runs to Bahia Blanca, 700 kilometres. It has a 500-kilometre branch to Tres Arroyos, and another of 150 kilometres to Mar del Plata, and three termini on the Atlantic seashore. The second in importance is the Buenos Ayres & Rosario, with its extension to Tucuman, 1,150 kilometres, and two branches of 75 and 188 kilometres. An extension is projected to Oran on the Bolivian boundary. The Buenos Ayres & Rosario is undoubtedly destined to become the Southern section of the much-spoken of North & South line through South America. The Central Argentine is one of the oldest roads in the country; it runs from Rosario to Cordoba, 420 kilometres, and has several feeders. It enters into Buenos Ayres over the Pergamino Branch of the Western and the Northern or Tigre line.

The Buenos Ayres Pacific is the eastern part of the Transcontinental Railroad (concessionaires, Juan Clark & Co.) It passes through agricultural and pastoral regions from Buenos Ayres to Villa Mercedes, province of San Luis, 675 kilometres long. It is noted for having a tangent of 423 kilometres. At Villa Mercedes on to the Pacific joins the Great Western Argentine to Mendoza, 360 kilometres, and San Juan, 515 kilometres. At Mendoza connects the Transandine Railway across the Andes, which is to join the Chilian system at Los Andes. The Pacific and Great Western Argentine are running. The Transandine is in course of construction, and before through communication is had between Buenos Ayres and Valparaiso, at least two years will elapse, judging from the present state of the works of the Transandine. The main tunnel, three kilometres long, near Uspallata, is the cause of the delay. This transcontinental line will suffer greatly from the difference of gauges. East of Mendozo the gauge is 5 ft. 6 in.; from Mendozo to Los Andes the gauge is 1 metre. Chilian railroads have a 4 ft. 8½ in. gauge.

Two local lines north and south of Buenos Ayres do considerable passenger traffic, the Northern to El Tigre, a noted resort, and the Ensenada to La Plata and Port Ensenada; the Northern is 40 kilometres, the Ensenada 75 kilometres long.

All the above-mentioned lines are in operation, owned and worked exclusively by English capital. They all have the 5 ft. 6 in. gauge. Another 5 ft. 6 in. gauge line is the Andino, from Villa Maria to Villa Mercedes, 260 kilometres. This forms the connecting link between the Central Argentine and the Transcontinental route, and is owned and operated by the national government. There are also several systems of one metre gauge line, the principal one being the Central Northern from Cordoba to Tucuman, 590 kilometres. It skirts the eastern slope of the Sierra de Cordoba, crosses the "Salinas" (salt deserts), and near Tucuman runs along the foot of the main range of the Cordilleras. Two branch lines, Dean Fanes to Chilecito, 300 kilometres, and Recreo to Catamarca, 240 kilometres, give access to the mining regions of San Juan and La Rioja in the Cordilleras. Another branch of 130 kilometres goes to Santiago del Estero. This town is also a station of the Rosario line. Beyond Tucuman the line is extended as far as Jujuy, 370 kilometres, passing through mountainous ground all the way. The ultimate object is to extend this line to Bolivia.

Another system of one metre gauge passes through the flourishing colonies of the province of Santa Fe. It is owned and operated by a French company, who have extended their line to Cordoba; in all about 1,000 kilometres. These one metre gauge lines of Santa Fe work in conjunction with the Central Northern, of the same gauge, and the connecting link between Santa Fe and Buenos Ayres is being built, thus making a continuous one metre line of about 1,800 kilometres.

In the provinces of Entre Rios and Corrientes, between Uruguay and Paraná rivers, there are some lines in operation, others in construction, aggregating some 500 kilometres; but these are all of a local character, having no connection with the trunk lines of the country; there the gauge is 4 ft. 8½ in. The Bahia Blanca & Northwestern, from Bahia Blanca to Villa Mercedes and Rio Cuarto, is the most important construction going on at present; gauge, 5 ft. 6 in.

A few remarks on construction and equipment of Argentine railroads might not be out of place. The present railroads are principally built through prairie districts, where the construction offers few difficulties. Wooden ties are used only for particular purposes, as for frogs and switches and bridges. Livesey's pots and pressed steel ties are mostly employed. Bridges are of iron and abutments of brick masonry or screw piles filled with concrete. The station buildings as a rule are very substantially built of brick and roofed with Marseilles tiles. Steel rails of 70 lbs. to the yard are mostly used on the broad gauge lines; on the metre gauge correspondingly lighter. There being no other suitable material for ballasting, the ties or pots are mostly bedded in black soil. Especially the pots require much keeping up. In the northern part of the Republic hardwood ties are extensively used, the quebrecho variety being preferred for their indestructibility. As to equipment, this is largely imported from England and Belgium, but the United States furnish their contingent also; in fact, several lines use American coaches, sleepers and locomotives exclusively. Freight cars are all of European make. The American sleeping-cars are nearly all from Harlan & Hollingsworth, in Wilmington, Del., and find universal favor; the English style of sleeping-car is gradually being abandoned.

Under the present financial difficulties of the Republic, no further extension of the railroads may be expected in the near future, for all railroads now running, excepting those in the immediate vicinity of Buenos Ayres, have at present not sufficient traffic to pay dividends, and will prove remunerative only as the country settles up and develops its grand resources. The provinces of Buenos Ayres and Santa Fe are the most populous, and in time of the harvest much produce is lost for want of cars to transport it to market.

Machine Stoking.

The London *Engineer* of Jan. 30, 1891, gives the gist of a paper on "Machine Stoking," read by Mr. John Frederick Spencer, M. Inst. C. E., at an ordinary meeting of the Institution of Civil Engineers, Jan. 27, 1891. The advantages claimed for machine stoking were:

1. Prevention of Smoke.—The efficiency of a machine stoker as a smoke preventor is due to its uniform careful firing. It is always working under Mr. C. Wye Williams' essential conditions of a green and a bright

fire on the same grate, and much better localized than with alternate side firing, when it is possible for the gases to escape on the green side without combining with the oxygen on the hot side. With movable bars, machine stoking is at the least a greatly improved system of combustion, tending to smoke prevention. And, finally, one great cause of smoke is entirely absent, viz., the frequent use of the slice and poker to rouse the fire and clean the bars. An observer outside a mill where the boilers are hand-fired can count the firing and stoking times by the emission of smoke from the shaft. In machine stoking it is only at long intervals that the door was opened, and then for a much shorter time.

2. Economy of Fuel.—In the case of machine stoking this may result from two distinct causes: First, the use of a cheaper coal, either too dirty for, or the heat units of which could not be fully utilized by, hand firing; second, the more perfect combustion due to a uniform supply of fuel, and the automatic and progressive manufacture of carbonic acid. With reference to the economy from the use of a cheaper coal than is possible with hand firing, the testimony is overwhelming and is rarely contested; but it is not so generally known that, owing to the more perfect combustion in machine stoking, the cheaper coal realizes also a higher evaporative duty per pound of fuel.

3. Machine stoking tends to an increased and more uniform evaporative duty; of this there is a large amount of evidence available. There are good reasons for anticipating a greater evaporative power with sprinkler than with coking stokers in certain cases. The automatic supply and progression of the fuel gives great uniformity of evaporation, while the mechanism employed affords facilities for varying it as may be required.

4. Economy of labor may be, and is, realized by machine stoking, as the system permits the automatic supply of fuel to the hoppers. In the mercantile steam navy machine stoking is hardly known, only a few vessels being fitted with Henderson's movable self-cleansing fire bars. It would be an efficient remedy for many sea troubles; it would save the loss in cleaning the fires and would give a larger increase in evaporation duty than forced combustion by fans, with much less inconvenience. An increased duty of at least 10 per cent. would be obtained from the fuel, and less skilled labor would be required. In addition to these advantages, all classes of cheap coal would be available for steamships, and smoke would be prevented.

Abstract of Patents on the Compound Locomotive.

II.

The first part of this abstract was published in the *Railroad Gazette* of Feb. 13. For the tabulated list of patents the reader is referred to that issue.

XVII.—Pat. No. 70,341. (*American Patent.*) *Inventor, John L. Lay. Dated Oct.* 29, 1867. Claim: A locomotive engine, constructed with high and low-pressure cylinders, the pistons of the high-pressure cylinders being upon the same rod with those of the low pressure, and the axis of each in line with the other.

XVIII.—Pat. No. 5,128. (*American Patent.*) *Inventor, H. W. Adams. Dated Nov.* 5, 1872. Claim: 1. A steam engine in which the steam from a small cylinder is admitted into a larger cylinder, in combination with a valve and a pipe, by which live steam may, as occasion requires, be admitted to the larger cylinder to re enforce the power of the engine. In a double cylinder engine, a nozzle for the escape of exhaust steam from the small cylinder into the pipe through which the larger cylinder is exhausted. The combination with the exhaust pipe of a steam engine of a nozzle, through which live steam can be discharged into the said pipe.

XIX.—Pat. No. 189,704. (*American Patent.*) *Inventor, A. M. Cumming. Dated April* 17, 1877. Claim: 1. In combination with the links operated by the eccentrics of a locomotive engine, the levers connected with the valve rods of the main or primary cylinders, and with the rock shafts connected with the valve rods of the secondary cylinders on opposite sides.

2. The combination of the primary cylinders provided with outside connections, and the secondary cylinders provided with inside connections.

3. In a locomotive engine, the inside connected secondary cylinders, the valves of which are operated by rockers controlled by the links on opposite sides of the locomotive.

4. The combination of the shaft for operating the secondary engine, and the rocker for operating the primary engine, both being connected by a single link, so that the valves of both may be reversed and controlled.

XX.—Pat. No. 232,438. (*American Patent.*) *Inventor, F. E. B. Beaumont. Dated Sept.* 21, 1880. Claim: 1. The method for regulating the working power to suit variations in the pressure of the working fluid by expansion apparatus, and applied to the fluid cylinder, whereby the supply of working fluid can be cut off sooner or later during each stroke.

2. The method of obtaining temporary energetic action by holding open the supply valves of the first cylinder, so that while its piston moves *in equilibrio* the full pressure of the fluid is admitted to act on the piston of the next larger cylinder.

XXI.—Pat. No. 264,937. (*American Patent.*) *Inventor, H. D. Dunbar. Dated Sept.* 26, 1882. Claim: 1. In an improved compound engine, a chest, having two steam chambers arranged side by side and communicating one with the other by a single port or passage way, controlled by a governing valve adapted to be operated by the engineer, with the valve seat in each chamber provided with the ordinary induction and exhaust ports, controlled in each chamber by a slide valve, and both moved simultaneously, two cylinders, one of which communicates directly with one of said steam chambers and the other cylinder with the other chamber through said induction ports, and each cylinder containing a piston secured to a single piston rod common to both, whereby both said pistons may be actuated by live steam at the same time, or one can be actuated by live steam and the other by exhaust steam.

2. In an improved compound engine, a chest having two steam chambers arranged side by side and communicating one with the other by a single port or passageway, in combination with a distributing or governing valve to control said port, and whose actuating rod extends out through said chest and is adapted to be operated by the engineer, whereby said valve may be moved by the engineer to control the passage of live steam, or of exhaust steam through said port.

3. In an improved compound engine, a chest having two steam chambers arranged side by side and communicating one with the other by a single port or passageway controlled by a governing valve adapted to be operated by the engineer to control the passage of live steam or of exhaust steam through said port, a saddle-piece having the seats for the valves in said chambers made on its upper surface and the seat in each chamber provided with induction and exhaust ports, controlled in each chamber by a slide valve, both moving simultaneously, two cylinders, one made integral with said saddle-piece and communicating with one chamber, and the other cylinder with the other chamber through said induction ports, and each cylinder containing a piston, both secured to the same piston rod.

XXII.—Pat. No. 270,167. (*American Patent*), *same as English Pat nt No.* 1,128.) *Dated Jan.* 2, 1883. *Inventor, F. W. Webb.* Claim: 1. The combitation of the two pairs of driving and carrying wheels, a pair of outside cylinders for driving one pair of said wheels, and a single inside cylinder placed in the central line of the engine for driving the other pair of wheels.

2. The combination of the two separately driven or uncoupled pairs of driving and carrying wheels, the outside cylinders worked by steam direct from the boiler for independently driving one pair of said wheels, and a single inside cylinder placed in the central line of the engine and worked by the exhaust steam from the outside cylinders to independently drive the other pair of wheels.

3. The combination of two pairs of driving and carrying wheels, cylinders for driving them, one pair of said wheels being worked by steam direct from the boiler and the other pair of wheels being worked by the exhaust, and the pipe or pipes which convey the exhaust steam through the boiler of the engine.

4. The combination of two pairs of driving and carrying wheels, two outside cylinders worked by steam direct from the boiler for driving one pair of wheels, a single central inside cylinder for driving the other pair of wheels, and valve mechanism, whereby the single central cylinder may be worked by the exhaust steam from the outside cylinders or by steam direct from the boiler.

5. The combination of a pair of driving and carrying wheels, two outside cylinders worked by steam direct from the boiler for driving said wheels, another pair of wheels coupled to and in rear of the pair above mentioned, another pair of driving and carrying wheels, and a single central inside cylinder for driving said wheels worked by the exhaust steam from the outside cylinders.

XXIII.—Pat. No. 276,368. (*American Patent.*) *Dated April* 24, 1883. *Inventor, H. D. Dunbar.* Claim: 1. In an improved compound engine, two cylinders whose axes are coincident, and each containing a piston secured to a rod common to both; a steam cheat whose valve seat is provided with induction ports and an exhaust port, an induction valve whose induction cavity is adapted to communicate with an alternate induction port at each movement of said valve, and which is in constant communication with the induction port, the induction ports and exhaust port, covered by an ordinary slide valve connected to and moved simultaneously with the valve by a rod common to both, the induction ports and exhaust port, and a distributing valve, and adapted to be moved independently to open or close said ports whereby live steam may be admitted to one cylinder and exhaust steam to the other, or live steam is admitted to both cylinders through a single steam chest.

2. In an improved compound engine, a single steam chest connected with a cylinder, and whose valve seat is provided with induction ports, communicating with said cylinder, and an exhaust port, an induction valve, whose induction cavity is adapted to communicate with an alternate induction port at each movement of said valve, and which is in constant communication with the induction port, two induction ports, and an exhaust port and a distributing valve, adapted to be moved independently to open or close said ports, whereby live steam or exhaust steam is received into and conducted through the same chest to the said cylinder to actuate the piston within, substantially as described.

3. A steam chest whose valve seat is provided with induction ports and an exhaust port, an induction valve, always covering said ports, and provided with an exhaust cavity and an induction cavity, having an opening in the valve face on three sides of said exhaust cavity, whereby said induction cavity may be in communication alternately with each induction port, and be in constant communication with the induction port, substantially as described.

XXIV.—Pat. No. 345,009. (*American Patent.*) *Dated July* 6, 1886. *Inventor, Isaiah Vernon.* Claim: 1. In an engine for utilizing exhaust steam, the cylinders connected by pipe, having exhaust inlet tubes, and having piston rods in connection with cranks on axle of the truck.

3. In an engine for utilizing exhaust steam, the combination of the truck provided with compartment, the cylinder, the tube, the pumps, the piston rods, the cranks, the wheels, and the axles all arranged substantially as and for the purpose set forth.

XXV.—Pat. No. 351,921. (*American Patent.*) *Dated Nov.* 2, 1886. *Inventors, W. B. & J. A. Johnson.* Claim: 1. The combination, in a locomotive engine, of four cylinders, two on each side of the engine, the high-pressure cylinders being fed directly from the boiler, each high-pressure cylinder exhausting by its own separate exhaust pipe into the two steam chests made common to the two low-pressure cylinders, the same being connected by a cross-pipe, the pistons both being on one rod.

2. The combination, in a locomotive engine, of four cylinders, two high-pressure and two low-pressure, the high-pressure being fed directly from the boiler, each high-pressure cylinder having its separate exhaust pipe leading into steam chests common to both the low-pressure cylinders, the valves being operated by a valve gear or link motion, with a link to each cylinder, the pistons being coupled to the cranks and wheels.

XXVI.—Pat. No 360,834. (*American Patent.*) *Dated April* 5, 1887. *Inventor, T W. Worsdell.* Claim: A steam generator, a high and a low pressure cylinder, a steam inlet pipe leading from said steam generator to the high-pressure cylinder, a connecting pipe leading from the exhaust of the high-pressure cylinder to the steam chest of the low-pressure cylinder, a branch pipe leading from the steam generator into the said connecting pipe, and an auxiliary starting valve, in combination with an automatic intercepting valve located in said connecting pipe between the point where said branch pipe enters the same and the high-pressure cylinder, said intercepting valve being of such a character that immediately exhausting takes place from the high-pressure cylinder the intercepting valve is automatically opened, and always remains open while steam is passing from the high to the low pressure cylinder, but can be closed before the auxiliary valve is opened.

XXVII.—Pat. No. 361,471. (*American Patent.*) *Inventor, A. von Borries. Dated April* 19, 1887. Claim: The combination of the high and low pressure cylinders of a compound engine and a connecting pipe or receiver for conveying the exhaust from the high-pressure cylinder to the low-pressure cylinder, with a valve chest in said pipe, a live-steam passage to the low-pressure cylinder, valve for said passage, and a valve between the two cylinders, the two valves being in the same valve chest and connected, so that the valve *d* closes as the valve *e* opens automatically under the pressure of the exhaust.

XXVIII.—Pat. No. 363,085. (*American Patent.*) *Inventor, S. Robinson. Dated May* 17, 1887. Claim: 1. An engine to be actuated by steam, air, or gas, having an internal cylinder mounted in the manner of a piston, and having a piston in the said internal cylinder, the said internal cylinder being coupled to the working parts of the engine, the external cylinder mounted in guides and free to play in same longitudinally, and coupled also to the working parts of the engine, and the piston of the internal cylinder connected to the external cylinder, said cylinders being arranged to move in opposite directions.

2. The combination of the external cylinder mounted to play longitudinally in guides, the internal cylinder mounted as a piston in the external cylinder, the tubular piston rod connected to the internal cylinder, the piston rod of the piston of the internal cylinder arranged in the said tubular rod, the cross head attached to the outer end of rod, and the rods which connect cross-head *h* with the external cylinder.

3. The combination of the external cylinder mounted to play longitudinally in guides, the internal cylinder mounted as a piston in the external cylinder, connected to and moving with the external cylinder, the tubular piston rod, connected to the internal cylinder, the rod of the piston of the internal cylinder, arranged in the said tubular rod, the packing box on the rod, which is constructed and arranged to serve as a guide for the cross head of the valve rod and said cross head and valve rod.

4. The combination, with the moving external cylinder, the internal cylinder and the piston of the latter cylinder, of the valve of the internal cylinder, its rod, the tubular rod incasing said rod, said rod attached to the internal cylinder and passing out through a packing box in the head of the external cylinder, and the cross head of the rod, provided with a packing box, through which passes the outer end of the rod.

XXIX.—Pat. No. 404,295. (*American Patent.*) *Inventor, R. Lindner. Dated May* 28, 1889. Claim: 1. In a starting gear for compound engines, the slide valve, with the ports on the exhaust side of the same fitted to the high-pressure cylinder, in combination with a high-pressure cylinder and low-pressure cylinder, and a steam pipe fitted with a suitable valve leading into the receiver pipe.

2. In a starting gear for compound engines the combination of the valve cylinders and valve, with plug, having the ports at right angles to each other, lever and rod, connecting the said lever to the reversing lever and pipe.

TECHNICAL.

Manufacturing and Business.

The Laidlaw & Dunn Co., of Cincinnati, O., is furnishing the Radford Pipe & Foundry Co. of Radford, Va., with 300 horse power of Galloway boilers and six steam pumps, including a 2,000,000-gallon duplex pumping engine to supply the works and the village.

The Wehn Pavement Co., New York City, has contracted to construct of its Lithogen artificial stone pavement the platforms around the new passenger station at Akron, O., for the Cleveland, Akron & Columbus, and the platforms, sidewalks and driveway at the new passenger station for the Louisville & Nashville at Louisville, Ky.

The Fontaine Safety Signal Co. has leased for a term of years a three-story brick building 50 × 225 ft. in Detroit. It will be used as a factory and office. At present the company is setting up the machinery. Its manufacturing facilities have thus far been confined to a capacity sufficient to fill sample orders. Some slight changes have been made during the past year in the details of construction of this signal, chiefly in the matter of materials used for different parts, and now the company feels warranted in turning out large orders. Work will begin at once on orders in hand, which will keep the works busy for some time. A side track connects the plant with the Michigan Central Railroad, thus affording the necessary transportation facilities. The building is heated throughout by steam and is equipped with electric light, elevators and all conveniences. Mr. Russell B. Owen, General Agent will have charge of the business department, and Mr. Eugene Fontaine, inventor of the signal, will be in charge of the mechanical department.

For the purpose of improving the quality of their product the Detroit Steel & Spring Works are putting in a hydraulic press of 300 tons capacity, and weighing 100 tons. It is proposed to place the steel, while yet soft, under the press, and thus reduce to a minimum the blow holes and other slight imperfections which might otherwise exist. This company in addition to its large output of tool steel is turning out larger numbers of the Farrell bandless springs for use on locomotives.

The Cliff & Righter Co., Ltd., manufacturers of elliptic and spiral car springs, at Oswego, N. Y., has recently assumed the corporate name of Oswego Railway Spring Co., Ltd. The change of firm name involves no change in the management, which is continued as heretofore. The officers are: Theo. Irwin, President; E. A. Van Horne, Vice-President; Geo. B. Sloan, Jr., Treasurer; C. C. Place, Secretary.

Cementing Iron.

The following mixture for cementing iron is strongly recommended: Equal parts of sulphur and white lead, with about one-sixth proportion of borax, are the constituents of the mixture, and the three should be thoroughly incorporated together so as to form one homogeneous mass. When the composition is to be applied it should be wetted with strong sulphuric acid, and a thin layer of it should be placed between the two pieces of iron to be connected, these being at once pressed together. This cement will hold so firmly as to resist the blows of a steam hammer, and dry so completely in a few days as to leave no trace of the cement, the work then presenting the appearance of welding.—*The Engineer.*

Car Heating.

The New York, New Haven & Hartford will equip a considerable part of its passenger stock with the "double disc drum" system of the Consolidated Car Heating Co. This was decided upon before the tunnel accident, and, in fact, negotiations have been going on for some months.

The Rail Market.

Steel Rails.—The market has been very dull for some weeks, and there seems to be little prospect of active trade for some time. The railroads are holding back all large orders for a reduction in prices. The market has been fairly firm, however, but it was reported last week that several orders were accepted under $30, the open quotation at New York.

Old Rails.—The quotations are: at New York for tees, $21 @ $22; at Pittsburgh, old iron rails, $25.50 @ $26 and for old steel rails, $18 @ $18.50; at Chicago, old iron rails, about $23 and old steel rails, $15 @ $18.50.

THE SCRAP HEAP.

Notes.

The New York Central & Hudson River has placed gates on the platforms of the cars in several of its local trains running between New York and Peekskill and Croton, and intends to put on more of them.

A press dispatch states that 32 firms of Baltimore have been swindled by the "United Travelers' Transportation" scheme, having for its pretended object a mileage ticket good over all railroads in the United States. Each of the swindled firms bought one or more tickets at $10 each.

The Pullman Co., at Pullman, Ill., this week announced a reduction in the price of erecting coal car bodies from $12 to $10. The men engaged in this branch of work, to the number of 150, at once quit work, but Manager Sessions says he can quickly fill their places.

A train robber in Texas has been sentenced to 99 years in the penitentiary, but the satisfaction with which that news is received is somewhat mitigated, says an exchange, by the statement that his companion, who received a similar sentence last September, has escaped from jail and is still at large.

Last week at Dalton and Clark's Summit, small towns on the Delaware, Lackawanna & Western, several employés of the road signed liquor license petitions. The temperance people carried the matter to General Manager Hallstead, and he immediately ordered the dismissal of all his men who had signed these petitions unless they would withdraw their names from the petitions. The names were at once withdrawn and the men are at work again.—New Milford (Pa.) *Advertiser.*

Working Expenses on English Railroads.

The results of the changes that are being made in the working hours on railways, and in other respects, are, perhaps, not so great as have been anticipated by some, and there are counterbalances in the falls in the prices of some materials; but still the proportion of the working expenses will be increased if the earnings prove to be stationary. It is certain that the amount paid for wages will be increased, because there is not only the effect of the decrease in the number of the hours worked and the higher pay for overtime, but there is also in some instances an increase in the actual wage paid—the basis of payment being increased. On the other hand, coal is lower in price to the railway companies this year—from 6d. to 1s. per ton in the case of one of the great railway companies—and iron and the materials it enters into are decidedly cheaper than they were a year ago; while the lower rates of sea freights will lessen the cost of some other of the railway stores. But the proportion of the working expenses would be seriously altered if the receipts of the companies are checked in the increase they have of late shown, because the tendency of expenses is in general to be enlarged. Whether anything will be done, as has been projected, to introduce the use of more machinery into the railway service, remains to be seen, but there is no doubt that the increase in the value of the labor employed will tend in that direction, and in many parts of the working of railways that is now possible, because the method of the disposal of merchandise traffic especially is one that can be only justified when the very cheapest class of labor can be employed. In the coal traffic, too, it is possible that something may be done to lessen cost of carriage, by the employment of larger wagons and the use of better methods of shipment at some of the ports from which coal is largely sent. In devising means to enable the railway companies to marshal trains and to "handle" goods with less labor there is yet scope for the mechanical engineer, and if this can be done the advance in the price of labor will be an advantage in the end. The difficulty is to be met in some way, because the average return that capital receives on the investment in railway stock is not large, and if labor is to have a greater amount out of the total, in some way working expenses must be diminished, for the average return is not likely to be decreased, if it can be prevented.—*The Engineer.*

"The G. H. H." Ticket.

Mr. G. H. Heafford, General Passenger Agent of the Chicago, Milwaukee & St. Paul, has issued a circular describing the latest form of his round trip excursion ticket devised for the purpose of preventing speculation in tickets. The essential feature of the ticket is a coupon, placed between the going and returning coupons, which takes the form of a receipt to be signed by the conductor. After tearing off the going coupon this receipt is given to the passenger, and the whole of the remainder of the ticket, including the contract, is taken up and sent to the ticket agent at the point where the return journey will be commenced. Here the passenger can reclaim his ticket by surrendering his receipt within one hour of the time he is to start back. Signatures are required on all portions of the ticket, there is a punch photograph and the time limit is on all the coupons; the train limit is written in in ink.

The Rope is a New Feature.

A rather curious incident occurred on the Central road last Thursday night. While the fast freight was bowling along in a deep cut near Griswoldville the engine ran over a mule. The locomotive was cutting its way through the thick fog at the time and the engineer didn't see the animal in time to slacken. There was nothing curious about running over a mule. Such incidents happen often. But the strange feature of the affair was that investigation the next day showed that the mule was an aged animal, and that it had been tied to the track. The mule had pawed a great hole in the track, and the rope with which it had been tied was found hidden in a pile of logs near by, having apparently been removed after the mule was killed.—*Macon Telegraph.*

Not Oil Right.

The Oil Valley Railroad Co., of Binghamton, N. Y., is evidently not an illuminating oil railroad, or we should have light upon its location other than its request for annual passes, which appearances strongly indicate is not oil right.—*Pathfinder*

The Intercontinental Railroad.

The Secretary of War has assigned the following officers for duty in connection with the survey and location of the proposed intercontinental railroad: Capt. Edgar Z. Steever, Third Cavalry; First Lieuts. R. M. Foote, Fourth Artillery, and Arthur Williams, Third Infantry; Second Lieuts, A. S. Roman, Ninth Infantry; A. T. Buffington, Seventh Infantry; C. A. Hedekin, Third Cavalry, and Samuel Reber, Fourth Cavalry. Three officers are yet to be assigned, making the party number ten.

LOCOMOTIVE BUILDING.

The Rhode Island Locomotive Works, of Providence, last week delivered the last six engines of the Union Pacific order for 71, which was placed last year. They are 10-wheel engines with Belpaire fire-box and 19 × 24-in. cylinders. The driving wheels are 5 ft. 2 in., and the boiler 64 in. in diameter at the waist. Two 10-wheel engines with 18 × 24 in. cylinders and 4 ft. 6 in. wheels were also delivered to the Boston & Maine. Two eight-wheel engines have been completed for a road in South America, which will be taken apart for shipment shortly. They have 15 × 20-in. cylinders, 48-in. wheels, 46-in. wagon top boiler. The engines weigh 59,000 lbs. in working order, and are built for a gauge of one metre, about 39.37 in.

ON the heavy portions of the Mexican Southern a special type of locomotive, designed to surmount steep gradients, will be used. This locomotive is a six-wheel coupled four-wheel bogie tank engine, with outside frames. Its leading dimensions are:

Cylinders (outside)	16 in. × 20 in.
Wheels, coupled	3 ft. 1½ in. diam.
Wheels, bogie	2 ft 3 in. diam.
Wheel base, rigid	7 ft. 1 in. and
Wheel base, total	18 ft. 11 in.
Heating surface: tubes, 816.5 sq. ft.; firebox, 76.2 sq. ft.; total, 892.7 sq. ft.	
Grate area	17.25 sq. ft.
Working boiler pressure	150 lbs. per sq. in.
Capacity of tank (at sides of engine)	1,200 galls.
Fuel space (at back of cab)	60 cu. ft.

The cab occupies the fore-part of the engine.—*Mexican Financier.*

CAR BUILDING.

The Railroad Equipment Company, of St. Paul, has leased to the Chicago, St. Paul & Kansas City 34 engines, four second-class passenger cars, one baggage and express car and 40 furniture cars at seven per cent. of their actual cost, or $396,204. They have also leased to the same road 1,000 box cars and two sleeping cars at a rental of seven per cent. per annum on their total cost per year, which is $528,625.

The Chicago, St. Paul & Kansas City has recently added 12 new passenger coaches to its equipment.

The Long Island road has issued specifications for 10 passenger cars and 50 platform and 50 box cars.

The 1,100 cars ordered by the Huntington & Broad Top and Susquehanna Coal Co. were divided among the following firms: Schall & King, York, Pa., 350; Erie Car Works, 450; Allison Mfg. Co., 300.

Some progress is understood to have been made by the Northern Pacific in the negotiations for placing the contracts for the large number of cars and locomotives for which it has been known to be in the market for some time.

The Gilbert Car Mfg. Co., of Troy, N. Y., has been awarded the contract for 11 passenger cars for the New York & Northern. Of these six will be light passenger cars for use on suburban trains, four will be day passengers cars and one combination car.

The Terre Haute (Ind.) Car & Manufacturing Co. is busy upon the following orders: 500 palace stock cars for the Pennsylvania; 100 coal cars for the Cleveland & Marietta; 150 box, 50 furniture and ten refrigerator (Tiffany pattern) for the Milwaukee, Lake Shore & Western; 300 (Union pattern) refrigerator cars for use of two large breweries at Milwaukee. Besides those enumerated there are several smaller orders, and in the wheel department, the Barr chill being used, things are moving briskly.

BRIDGE BUILDING.

Fort Worth, Tex.—The Lane Bridge & Iron Works has been awarded a contract to build a bridge over the Trinity River, at Fort Worth.

Rome, Watertown & Ogdensburg.—This road is building new iron bridges at the crossing of the Mohawk River in Utica, at Stittville, Remsen and Sugar River, and new structures will be placed at other points as fast as possible.

Shepherdstown, W. Va.—The contract has been let by the Norfolk & Western for replacing the wooden trestles connecting the bridge over the Potomac River at Shepherdstown with iron structures.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In the United States Supreme Court plaintiff, a New Hampshire corporation operating a road from N. to L., and defendant, a Massachusetts corporation operating a railroad from L. to B., in the latter state, entered into a joint traffic agreement providing that the two roads were to be operated as a single road, under joint management; that the property of each party should be kept in the same relative condition as at the time of the making of the agreement, at their joint expense; that plaintiff should erect, at its own expense, a freight depot in L., and defendant, at its own expense, a passenger depot in B.; that buildings destroyed by fire should be restored by the owner at his own cost, and that the interest upon the debts contracted by either party should be paid out of its own share of the net income. The Court holds that a passenger depot at B., in addition to the one provided for in the agreement, having become necessary to retain the increased business of the joint management, the directors of plaintiff had power to agree that the interest on expenditures made by defendant in the erection of such additional depot should be charged as a part of the operating expenses of the joint management.[1]

In the United States Supreme Court it is held that Congress has the right, in the exercise of the power of eminent domain, to grant the right of way to a railroad company, incorporated under the laws of a state, through the lands owned by the Cherokee nation, where the operation of the railroad will have relation to interstate commerce.[2]

In Minnesota it is decided by the Supreme Court that one who sold a locomotive to a railroad company six months before the appointment of a receiver was not entitled to a lien upon the earnings of the receivership prior to that of the mortgage bondholders.[3]

In the Federal Court, the bonds in excess of the amount which a township was authorized to issue were obtained from the state treasurer on a false certificate by the township trustee that the conditions on which they were issued had been complied with. The railroad company was cognizant of the fraud, and receipted to the treasurer for the bonds, but never had actual possession of them, though it assented to their delivery to the contractor by the township trustee in payment for construction work. The court holds that this did not constitute a negotiation of the bonds to an innocent purchaser; and, as the conditions on which they were issued had not been complied with, the consideration had failed, and the township was entitled to a decree for their surrender and cancellation.[4]

In Oregon it is ruled that the statute which provides for a mechanic's lien upon "any building, wharf, bridge, ditch, flume, tunnel, fence, machinery or aqueduct, or other structure," authorizes a lien upon a railway as properly coming under the head "other structure."[5]

The Supreme Court of Kansas holds that the statute requiring railroad companies to fence their tracks by and through lands inclosed with a lawful fence is not unconstitutional as being for the benefit of the land owner alone. It is designed to protect the traveling public from accident to trains by collisions with animals, and is a valid exercise of the police power.[6]

Carriage of Goods and Injuries to Property.

In Alabama the plaintiff shipped a stallion in a freight car of defendant, and to insure ventilation left the side door open, nailing some strips of board across the opening. The slats were kicked off, and the stallion escaped uninjured, and, after wandering some distance, strayed upon the track at another point, and was killed by defendant's train. The Supreme Court rules that the measure of damages is the value of the horse, and is not limited by the terms of the shipping contract, which stipulated that, from any injuries resulting from a failure of the company to perform its conditions, "the amount claimed should not exceed, for a stallion or jack, $200."[7]

In New Jersey it is held that the fact that a servant of plaintiff accompanied cattle shipped by him over defendant's road, and that the servant rode on a free pass, did not exempt defendant from liability for injuries to the cattle caused by the want of proper care on the part of defendant's agents, there being no express contract to that effect.[8]

In the above case a heavy snowstorm caused the stoppage of defendant's train at a station, and plaintiff's cattle, which had just been placed on board the train for shipment, were unloaded and put in cattle sheds, where they were injured by cold and exposure. Defendant had horse stables which were substantially built and covered, and which could have been used as a temporary shelter for the cattle. The weather was not unusual for the time of year. The court holds the railroad responsible."

In Alabama it is ruled that a provision in a carrier's receipt that, if the value of the goods delivered is not stated by the shipper at the time of shipment, and specified in the receipt, the holder will not demand more than a particular sum for loss or damage, exempts the carrier from greater liability, only when the loss occurs without negligence on its part, and the burden is on the carrier to show absence of negligence.[10]

In Wisconsin it is ruled that the building of a track along a street, more than 10 ft. east of the centre line, is not an appropriation of property abutting on the west side thereof, for which damages can be recovered.[11]

In California the Supreme Court holds that a railroad having no positive knowledge as to the ownership of land, while guilty of a technical trespass, does not become a tort-feaser by entering on the land, and constructing a bridge or track thereon, intending subsequently to condemn it to the public use; and the land-owner, who himself was ignorant of his title at the time of the entry, is not entitled to have the value of such track and bridge allowed to him as a part of his "just compensation" for the taking of his land.[12]

In Illinois the Supreme Court rules that the jury in estimating the damage to that part of the farm not taken for the right of way may consider the danger that passing trains will cause fires and kill stock on the farm.[13]

In Alabama it is ruled that a railroad is liable for an animal killed by the failure of the engineer to keep a diligent lookout, though, after perceiving it, he used all possible means to avoid striking it.[14]

In Oregon it is held that where plaintiff saw a fire, kindled by a locomotive, burning in some dry grass upon defendant's right of way near his own hay-field, and was in a position to put it out, but made no effort to do so, he is precluded from recovering for the burning of his hay.[15]

In Alabama the Supreme Court holds that damages for the taking, and injury to the land, belong to the owner at the time of the injury, and did not pass to a grantee with the title to the land.[16]

Injuries to Passengers, Employes and Strangers.

In Oregon the Supreme Court rules that a person who has purchased no ticket and paid no fare, who goes to a caboose attached to a freight train, and, without the knowledge of those in charge of such train, attempts to get into said car at a place where the railroad company is not accustomed to receive passengers, is not a passenger, and the company is not liable for injuries in the attempt to board the train.[17]

In New York a conductor was hurt by a collision between trains in a freight yard. The assistant yard-master was not on duty on the night of the collision. There was no lack of men to attend the making up of trains and shifting cars. The gangs were full and the men all there, and they were able and competent to do the work. It was unusual for the yard-master or his assistant to take any part in it. The Supreme Court rules that the verdict cannot be sustained on the ground that the jury had a right to say that the absence of the assistant contributed to the collision.[18]

In Michigan it is ruled that the duty of a brakeman to test the brakes, to see that they work properly, does not require him to look for defects in the chain which are not apparent except on a careful examination, link by link; and his failure to discover such defects is not contributory negligence.[19]

In Louisiana it is held by the Supreme Court that a servant in a railroad yard is guilty of contributory negligence who jumps from a moving engine in front of it, and between the rails, and is run over, when there is nothing to prevent his jumping to the side of the track, and he could do so with comparative safety.[20]

In New York, in an action for personal injuries sustained by the insufficiency of the brakes to hold the train, on which plaintiff was a brakeman, while going down a steep grade, defendant relied on printed rules that instructed the brakemen to test all the brakes before leaving a terminal station, which plaintiff had failed to do. Plaintiff had never read the rules, and was ignorant of their existence. The Supreme Court rules that he was not negligent in failing to know rules which had never been brought to his attention.[21]

In Indiana the Supreme Court rules that a foreman employed by a railroad company, having exclusive charge and control of the laborers working under him, with full authority to direct where they shall work, is not a fellow servant of the laborers, and the railroad company is liable for his negligence in ordering them to work in a dangerous place.[22]

In Minnesota it is held that, under the statute making railroads liable to one servant for injuries by the negligence of another, a sectionman struck by an engine while taking a hand-car from the track may recover for the negligence of an engineer in following the car too closely.[23]

In Minnesota plaintiff's evidence showed that he was walking on a dirt pile alongside defendant's track, and too near it for safety; that the track was straight and unobstructed, and plaintiff knew that trains passed frequently, but he suffered his attention to be attracted by something on the opposite side of the dirt pile, and was struck by a train; that he might well have walked on the sidewalk on the opposite side of the track. The Supreme Court holds that plaintiff was guilty of contributory negligence.[24]

In Pennsylvania the plaintiff testified that the crossing was blocked with a freight train, which the employés undertook to cut, and he, having come as near as practicable, stopped and looked and listened, and could see a long distance in the direction the train came, but saw and heard nothing. When the train was about cut, he turned his team, and waited about half a minute until it was cut, and then attempted to cross, and was struck by a train passing on the opposite track, which train, he testified, gave no signal of its approach. The Supreme Court rules that he could not be said to be guilty of contributory negligence as matter of law.[25]

In Wisconsin, when plaintiff was within 48 ft. of the track he might have been seen from the engine when it was within 1,235 ft. of the crossing, and the train could

have been stopped within a distance of 600 ft. while running 36 miles per hour. There was no evidence that the attention of the persons operating the engine was diverted, yet plaintiff testified that no signal was given, and the train conductor testified that the brakes were not applied until the train was near or on the crossing. The statutory speed was six miles per hour. The Supreme Court holds the railroad liable.[26]

[1] Nashua & L. R. Corp. v. Boston & L. R. Corp., 10 S. Ct., Rep., 1,004.
[2] Cherokee Nation v. Southern Kansas Ry. Co., 10 S. Ct. Rep., 965.
[3] Manchester Locomotive Works v. Truesdale, 46 N. W. Rep., 301.
[4] Wilson v. Union Sav. Ass'n. 42 Fed. Rep., 421.
[5] Giant Powder Co. v. O. Pac. R. Co., 42 Fed. Rep., 470.
[6] M. P. Ry. Co. v. Harrelson, 24 Pac. Rep., 465.
[7] Louisville & N. R. Co. v. Kelsey, 7 South Rep., 648.
[8] Feinberg v. D., L. & W. R. Co., 20 Atl. Rep., 33.
[9] *Id.*
[10] South Ex. Co. v. Seide, 7 South. Rep., 547.
[11] First Congregational Church v. Milwaukee & L. W. Ry. Co., 45 N. W. Rep., 1,086.
[12] Albion R. R. Co. v. Heeser, 24 Pac. Rep., 288.
[13] Chicago, P. & St. L. Ry. Co. v. Aldrich, 24 N. E. Rep., 763.
[14] East Tennessee, V. & G. R. Co. v. Watson, 7 South Rep., 813.
[15] Eaton v. O. R. & N. Co., 24 Pac. Rep., 415.
[16] Evans v. Savannah & W. R. Co., 7 South Rep., 758.
[17] Haase v. Oregon Ry. & Nav Co., 24 Pac. Rep., 238.
[18] Harvey v. New York Cent. & H. R. R. Co., 10 N. Y. (Supt.), 645.
[19] Morton v. Detroit, B. C. & A. R. Co., 46 N. W. Rep., 111.
[20] Dandie v. Southern P. R. Co., 7 South Rep., 792.
[21] Le Croy v. New York, L. E. & W. R. Co., 10 N. Y. S., 382.
[22] L., N. A. & C. Ry. Co. v. Graham, 24 N. E. Rep., 668.
[23] Smith v. St. Paul & D. R. Co., 46 N. W. Rep., 149.
[24] Heflinger v. Minneapolis L. & M. Ry. Co., 45 N. W., 1151.
[25] Bare v. Pennsylvania R. Co., 19 Atl. Rep., 935.
[26] Piper v. C. M. & St. P. R. Co., 46 N. W. Rep., 165.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Fort Wayne & Jackson, 2¾ per cent. on the preferred stock, payable March 2.

Manhattan (Elevated), quarterly, 1½ per cent. in cash, payable April 1.

Northern Pacific, quarterly, $1 per share on the preferred stock, payable April 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlanta & Charlotte Air Line, annual, 48 Wall street, New York City, March 11.

Bedford & Bloomfield, annual, 47 Broadway, New York City, March 11.

Charleston & Savannah, annual, Charleston, S. C., March 2.

Cincinnati & Muskingum Valley, annual, Zanesville, O., March 24.

Danville & Seaboard, annual, Atlantic Hotel, Norfolk, Va., March 2.

Detroit, Charlevoix & Escanaba, annual, Charlevoix, Mich., March 4.

Elizabethtown, Lexington & Big Sandy, annual, Lexington, Ky., March 18.

Florida Central & Peninsula, annual, Jacksonville, Fla., March 5.

Grand Rapids & Indiana, annual, Grand Rapids, Mich., March 4.

Gulf, Colorado & Santa Fe, annual, Galveston, Tex., March 3.

Illinois Central, annual, Chicago, Ill., March 11.

Kansas City, Clinton & Springfield, annual, Kansas City, Mo., March 11.

Kansas City, Fort Scott & Memphis, annual, Kansas City, Mo., March 11.

Kansas City, St. Louis & Chicago, annual, St. Louis, Mo., March 10.

Kentucky Central, annual, Covington, Ky., March 17.

Louisville, New Albany & Chicago, annual, 47 Broadway, New York City, March 11.

Missouri Pacific, annual, St. Louis, Mo., March 10.

Morristown & Cumberland Gap, special, Morristown, Tenn., April 9, to act upon a proposed increase of capital stock.

New York & New England, annual, 88 Tremont street, Boston, Mass., March 10.

Norfolk Southern, annual, Elizabeth City, N. C., March 5.

Norfolk & Virginia Beach, special, Norfolk, Va., March 2.

Northwest & Ottawa, special, Montreal, Que., March 17, to authorize an issue of bonds.

Oregon Short Line & Utah Northern, annual, Salt Lake City, Utah, March 18.

Ottawa, Arnprior & Renfrew, special, Ottawa, Ont., March 16.

Pennsylvania, annual, Philadelphia, Pa., March 10.

Peoria, Decatur & Evansville, annual, Peoria, Ill., March 3.

St. Louis, Iron Mountain & Southern, annual, St. Louis, Mo., March 10.

Saugeen Valley, annual, Walkerton, Ont., March 3

Savannah, Florida & Western, annual, Savannah, Ga., March 4.

Terminal Railroad Association of St. Louis, annual, St. Louis, Mo., March 3.

Texas & Pacific, annual, 195 Broadway, New York City, March 18.

West Jersey, annual, cor. Delaware and Federal streets Camden, N. J., March 3.

West Jersey & Atlantic, annual, cor. Delaware and Federal streets, Camden, N. J., March 3.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings of the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1 122 Girard street, Philadelphia, on the first and third Saturday, of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8:00 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

American Railway Master Mechanics' Association.

The committee appointed to recommend whether the Association can endorse the action of the Master Car Builders' Association in recommending the vertical plane coupler as a standard, has asked members to reply to the following questions:

1. Do you recommend the introduction of the vertical plane type of coupler known as the Master Car Builders' standard for freight cars as an element of safety to human life, and can you endorse it, viewed from the standpoint of economy?

2. If you have a preference for another style of coupler that will accomplish the result sought, please give its name and general features of construction.

3. What changes, if any, would you recommend in the vertical plane (M. C. B.) type of coupler as at present constructed?

4. From a mechanical standpoint, do you regard the Master Car Builders' standard coupler, as at present constructed, as efficient as any known device for the purpose intended?

Answers should be addressed to John Hickey, Master Mechanic, Milwaukee, Lake Shore & Western, Kaukauna, Wis.

Engineers' Club of Minneapolis, Minn.

The annual meeting was held Jan. 15 at the Public Library, President William A. Pike in the chair, and 16 members present. President Pike reported that the second joint meeting with the Society of Civil Engineers of St. Paul would be held in Minneapolis, March 5. A committee consisting of F. W. Cappelen, Chas. O. Huntress, and T. P. A. Howe was appointed to make proper arrangement for the entertainment of the club in Minneapolis. The following officers were elected: President, Wm. A. Pike; Vice-President, T. P. A. Howe: Secretary and Treasurer, F. W. Cappelen; Librarian, A. B. Coe. Member Board of Managers Association of Engineering Societies, Andrew Rinker.

Freight Claim Association.

The annual spring meeting of the Railway Freight Claim Association of the Eastern, Western and Southern States will be held at Atlanta, Ga., on March 5 next.

PERSONAL.

—Mr. Isaac N. Mills, Superintendent of the Delaware division of the Philadelphia, Wilmington & Baltimore, has been granted a year's leave of absence to begin May.

—Mr. Robert J. Fisher, Assistant Commissioner of Patents in Washington, has been appointed General Counsel of the Eastern Railroad Association to succeed Mr. Andrew McCallum, deceased.

—Mr. Milton A. Knapp, a lawyer of Syracuse, N. Y., has been appointed Interstate Commissioner by President Harrison to take the place of Commissioner Schoonmaker, whose term expires March 23. Mr. Knapp is about 40 years old and has practiced in Onondaga County many years.

—Mr. Norman Beckley, who is now near his 70th year has resigned his position as General Manager of the Cincinnati, Wabash & Michigan. He was appointed to the office in 1878, having been previously Assistant Division Superintendent of the Lake Shore & Michigan Southern. He was born in Vermont and was for a number of years section foreman and roadmaster on the Vermont Central, and held positions in the construction department of other New England roads.

—Mr. John Wiley, of the publishing house of John Wiley & Sons, of New York, died at his home, East Orange, New Jersey, Feb. 21. Mr. Wiley was born in Flatbush, L. I., Oct. 4, 1808. When he was 17 years of age he went into business with his father, a publisher in New York. Subsequently, the firm became Wiley & Putnam, then John Wiley, and later, John Wiley & Sons. The house is the most enterprising, and probably the most successful, scientific publishing concern in America. On its list will be found the names of the most eminent scientific writers of recent years. The house has also long made a specialty of the works of Ruskin. Mr. Wiley was active in church and missionary work, and was an advocate of international copyright.

ELECTIONS AND APPOINTMENTS.

Anthracite.— The following are the directors of this new Colorado road: John B. Wheeler, Enos T. Hotchkiss, George H. Duke, Edward D. Kellogg, T. H. McGranahan, Alfred R. King and George Stephan.

Bangor & Broostook.—The incorporators of this Maine company are as follows: Charles V. Lord, N. E. Bragg, C. A. Gibson, C. C. Prescott, P. A. Strickland, N. C. Ayer, H. P. Oliver, J. P. Bass, F. H. Appleton, George Stetson, C. F. Bragg, E. L. Stewart, B. B. Thatcher, A. H. Thaxter, Samuel Sterns, of Bangor, Me.; A. A. Burleigh, A. H. Fogg, Houlton, Me., and Willis I. Shaw, New Limerick, Me.

Charleston, Cincinnati & Chicago.—Judge Morris, of the Scott County (Va.) Court, has appointed A. B. Harris, a director of the company, receiver for the section in Virginia. Temporary receivers have been appointed in South Carolina, and Tennessee also, and proceedings have been begun in Kentucky. D. H. Chamberlain has been appointed permanent receiver in South Carolina.

Chicago, St. Paul, Minneapolis & Omaha.—The company has transferred its electrical department to the telegraph department, which will be under the charge of H. C. Hope, with the title of Superintendent of Telegraph and Signals.

Cincinnati & Springfield.—The following officers were elected by the directors last week: Joseph Ramsey, Jr., President; J. C. Davie, Secretary, and George S. Russell, Treasurer.

Continental.—The incorporators of the Colorado company have elected the following officers: President, E. P. Wells; Vice-President, J. R. Hicks; Secretary, M. Wells; General Manager, E. W. Penfield, of Chicago.

Delaware, Lackawanna & Western.—The stockholders held their annual meeting at 26 Exchange Place, New York City, Feb. 24, and re-elected the following: President, Samuel Sloan; Secretary, Fred. F. Chambers; Treasurer, Frederick H. Gibbens. Board of Managers: John I. Blair, George Bliss, Percy R. Pyne, Wilson G. Hunt, Benjamin G. Clarke, Sidney Dillon, Russell Sage, Edgar S. Auchincloss, Andrew T. McClintock, William H. Appleton, W. W. Astor, Henry A. C. Taylor, Eugene Higgins and William Rockefeller.

Kingston & Pembroke.—The following Board of Directors was re-elected at the annual meeting: C. F. Gildersleeve, President; John D. Flower, Vice-President; Hon. G. A. Kirkpatrick, B. W. Folger, H. H. Porter, R. P. Flower, M. H. Folger and M. Seibert.

Little Falls & Dolgeville.—The directors of this new company are: Warren H. Loss, 10 Wall street; E. T. Wastell, 52 Broadway; E. H. Talbott, S. B. McConnico and E. C. Warren, 15 Wall street; Alfred Dolge, 122 East Thirteenth street; C. H. Scrymser, 18 Cortlandt street, all of New York; Titus Sheard, J. S. Barnett and J. J. Gilbert, Little Falls, N. Y.; Edward Brown, Dolgeville, N. Y.; W. W. Worthington, Caldwell, N. J., and Henry Earl, New York City. President, Warren H. Loss; Secretary, E. T. Wastell.

Meridian, Brookhaven & Natchez.—The following directors were elected at a meeting in Brookaven, Miss.: J. M. Turner, President, and J. W. McGrath, Secretary and Treasurer. Directors: R. Z. Thompson, Zeber Craft, John McGrath, J. M. Turner, G. C. Haskins and J. W. McGrath.

Mobile & Ohio.—At the annual meeting of the company, held in Mobile, Ala., Feb. 18, the following directors were elected: James C. Clarke, Sidney Shepard, A. H. Stevens, James H. Fay, F. D. Tappen, W. L. Hearin, Adrian Iselin, Jr., H. B. Plant, R. K. Dow, John Paton, E. L. Russell, Thomas W. Evans and W. Butler Duncan.

Nora Scotia Midland.—The following are the officers of this company: President, Herbert Richmond, 52 Broadway, New York; Vice-President, S. H. Holmes, Halifax, N. S.; and General Manager, H. W. Lester, New Glasgow, N. S.

Pennsylvania & Northwestern.—The following were re-elected at the annual meeting held in the Bullitt Building, Philadelphia, Pa., Feb. 18: President, Edward J. Berwind; Directors, H. A. Berwind, John H. Converse, Aaron Fries, Stephen Greene, Samuel G. Lewis and John Reilly.

Pennsylvania, Poughkeepsie & Boston.—H. H. Kingston, General Manager, was appointed Receiver last week by order of the court at Easton, Pa., of that part of the Poughkeepsie Bridge system extending from Campbell Hall, N. Y., to Slatington, Pa., 95 miles.

Philadelphia & Erie.—W. F. Hopkinson, who has for some time been Assistant Engineer of the Elmira & Canandaigua Division of the Northern Central, has been transferred to a similar position on this road at Renovo, Pa.

Philadelphia & Trenton.—The annual meeting, held at Philadelphia, Pa., Feb. 18, resulted in the election of the following: President, William H. Wilson; Secretary, James R. McClure; Treasurer, John M. Wood. Directors, G. M. Dorrance, George B. Roberts, Wistar Morris, Alexander Biddle, N. Parker Shortridge, J. N. Du Barry, Alexander M. Fox, Henry D. Welsh, W. H. Wilson, Henry H. Houston, Amos R. Little, and Frank Thomson.

Summit Branch.—At the annual meeting in Philadelphia the following directors were elected: George B. Roberts, A. J. Cassatt, Wistar Morris, N. P. Shortridge, J. N. Du Barry, John P. Green, I. J. Wistar, William J. Howard, William H. West, George F. Swift and Amos R. Little.

Texas Cattle Trail.—At an adjourned meeting of the company, held in Fort Worth, Tex., last week, the following officers were elected: President, George M. Dilley, Dallas; Vice-President, B. M. Logan, Vernon; Secretary, R. B. Gaut, Vernon; Treasurer, R. S. Kelly,

Vernon; Manager and Financial Agent, Stanley M. Jones. The headquarters have been changed from Albany, Tex. to Vernon, Tex.

Toledo, Ann Arbor & Mackinaw.—The first board of directors is as follows: H. W. Ashley, E. A. Todd, Jr., T. W. Whitney, I. A. Fancher, F. S. Chandler, F. Gossman. They have elected the following officers: I. A. Fancher, President; H. W. Ashley, Vice-President and General Manager; F. S. Chandler, Secretary and Treasurer. The headquarters of the company will be at Owosso, Mich. These are officers of the Toledo, Ann Arbor & North Michigan.

Union Pacific.—E. E. Calvin, Division Superintendent of the Missouri Pacific road, has been appointed Superintendent of the Idaho Division, with headquarters at Pocatello, Idaho, to succeed W. L. Ryder, resigned.

Western Pennsylvania.—J. N. Du Barry was elected President, and John P. Green, Wistar Morris, G. B. Roberts and Henry D. Welsh directors, at the annual meeting, in Philadelphia, Pa., Feb. 18.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Abbeville & Waycross.—The first 13 miles of this road from Abbeville, Ga., is in operation, and the directors have recently authorized an extension 20 miles long toward Waycross, Ga. The work on the extension will begin early in March.

Anthracite.—A company has been incorporated in Colorado to build a road to the coal mines about Aspen. The route is from Delta to a point on the Denver & Rio Grande, and northeast to Black Cañon, up the Gunnison River to its north fork, thence up Clear Creek to Rock Centre, and to a connection with the Colorado Midland near Roaring Fork. The capital stock is $100,000. The principal office will be at Delta.

Atlanta, East Lake & South River.—A charter was granted in Georgia last week to this company, which proposes to build a road about nine miles long, from a point in Atlanta through DeKalb County to South River.

Augusta Belt.—E. J. O'Connor is reported to be interested in a belt road proposed to be built at Augusta, Ga. It will probably be 15 miles long, and a company is being organized to build it.

Birmingham, Mobile & Navy Cove.—The history of this company is mainly one of successive reorganization. Little else has been accomplished except the election of new officers. After each change it has been claimed that all the money required to build the line had been obtained, and that it would be completed before the end of the year. These promises have never been kept, but a similar one has been again made in the past few weeks. E. T. Warner, of Lexington, Ky., is quoted as saying that he has a sub-contract from a construction company organized in the East to build the line from Mobile south along the eastern shore of Mobile Bay to the Gulf of Mexico.

Buffalo Dock & Connecting.—Renewed efforts are being made to secure a right of way for this line between the Hamburg Canal and Black Rock, north of Buffalo, N. Y., and for the purchase of the real estate needed by the company. Estimates and profiles are also being made, and the company expects to let the contracts for building the line very soon. It is to extend through the city of Buffalo, from the east end of the Hamburg Canal, north along the harbor to Black Rock.

Central of Georgia.—The reports are renewed of a proposed extension of the Columbia branch of the Southwestern division from the Chattahoochee River at Columbia, Ala., southwest to Ashford, on the Alabama Midland, and thence to Geneva and Pollard.

Chesapeake & Ohio.—Grading is reported in progress on the branch from Covington, Va., on the main line north through the Warm Spring Valley. The work has been let in four sections. The line follows the Jackson River to within 10 miles of Hot Springs. The last section is located in the Warm Springs Valley.

Chicago, Forest & Eastern.—The company was incorporated in Illinois last week to build a road through Cook, Will and Kankakee Counties in Illinois to the Indiana state line. The capital stock is $2,000,000, and the incorporators, who are the first Board of Directors, are George H. Weldon, A. F. Drentzer, William A. Cottrell, A. C. Hawley and Charles G. Welton, all of Chicago.

Chicago & West Michigan.—The Common Council to Charlevoix, Mich., has voted $25,000 to this company of have the proposed extension from Traverse City to Petoskey built to that town. The officers of the company have stated that work on the extension will undoubtedly be commenced this year, and trains will be running as far as Charlevoix within 18 months. The line has been surveyed, and it is expected that the directors will authorize its construction immediately.

Clarendon, Oklahoma & St. Louis.—The company was organized in Texas last week to build a road from Clarendon, Tex., northerly through Donley, Collingsworth and Greer counties, in Texas, about 70 miles to the junction of the Elm and North Forks of the Red River. The capital stock is $1,000,000.

Clermont & Bradford.—The petition of this company, asking for the dissolution of the corporation, was filed in the Court of Common Pleas at Philadelphia last week. The proposed road was to be 14 miles long, and was to extend from Clermont to Mount Jewett, McKean County, Pa. It had been partly surveyed, but the petition alleges that the company has been unable to raise the money necessary for its completion, and that the construction of other roads renders its building unnecessary.

Continental.—The Continental Railway & Telegraph Co. is the full and ambitious title under which E. W. Penfield, of Chicago, James R. Hicks, E. P. Wells and M. Wells, and M. Benedict have filed articles of incorporation in Colorado to build a road from Denver in a westerly direction through the counties of Arapahoe, Jefferson, Boulder, Gilpin, Clear Creek, Grand, Eagle, Garfield, Routt, Rio Blanco and Mesa to the western boundry of Colorado. The capital stock is placed at $200,000.

Corpus Christi & South America.—The Pan-American Construction Co. is the name under which the syndicate which proposes to build this line has been organized. The capital stock is $10,000,000. The road has been graded from Corpus Christi south about 25 miles to Laureles, Tex., and the contractors are now working west of that point and south of the Agua Dulce. The locating survey has been completed through Nueces County and the engineers are now surveying through Cameron County. A new town has been located in the former county about 40 miles from Corpus Christi, and the grading will be continued to that point as fast as possible.

Duluth & Winnipeg.—The contract has been let to the Illinois Steel Co. for furnishing 17 miles of rails for the extension from Cloquet east to Duluth, Minn. It amounts to about $30,000.

Empire & Dublin.—The grading on the extension from Hawkinsville west to Grovania, Ga., a distance of 13 miles, has been finished to within a mile of the proposed terminus. The work is being rapidly pushed and the right of way has been cleared the entire distance.

Fincastle & Troutville.—A contract has been made with the Roanoke & Botetourt Construction Co. to finish the grading and tracklaying from Fincastle south to Troutville, Va., on the Shenandoah Valley road, north of Roanoke. The company will not begin work on the contract until May. The line is being built by the Fincastle & Botetourt Development Co.

Geneva & Van Ettenville.—The chief engineer has postponed awarding the contracts for the grading on that part of this road from Geneva south 13 miles to Willard, and from Van Ettenville, N. Y., the southern terminus, north to Odessa, a distance of 14 miles. It is expected that the examination of the bids will be finished and the contracts awarded next week. Part of the grading was placed under contract some weeks ago, and the bids just received were for the balance of the work, not let that time.

Georgia Southern & Florida.—The grading on the extension from Tiffin southwest to Thomasville, Ga., has been delayed beyond expectation, but the line will be opened for traffic by Aug. 15 next. About half the grading has been finished and the contractors will soon have a very large force on the balance of the line. It is about 52 miles long. The grading will also soon be resumed on the extension of the Macon & Birmingham, west from La Grange to Birmingham, Ala.

Glasgow Belt.—Surveying has been commenced on the belt road to be built by the Rockbridge Co., to connect by Glasgow, Va., with the mines and the new industries being located in Arnold's Valley.

Houston, Central Arkansas & Northern.—Henry, Forrest & Co., of St. Louis, have been working on the southern extension of this line from Columbia to Alexandria, La., for several months, and about 50 miles of the extension has been graded and the track laid on part of the distance. A. F. Rust, of Columbia, is Chief Engineer.

Interoceanic.—The last track between the City of Mexico and Vera Cruz will probably be laid next month, and there will then remain only the ballasting and finishing to complete that division. At present the tracklaying on the gap between Vera Cruz and Jalapa is being delayed on account of the work on a large cut. Traffic will probably commence between the coast and the capital about May 5. The track has been laid for nearly 60 miles from Vera Cruz to Jalapa, and for six miles easterly from the latter place. The distance between the two towns is about 85 miles, so that the track has only to be laid on a section of 20 miles to complete the road.

Kansas City, Watkins & Gulf.—The charter of the Rapides Bridge Co. for a bridge across the Red River in the Southern part of Alexandria, La., has been assigned to this company, and it will immediately begin erecting the structure. The Prosser-Ware Construction Co., of St. Louis, which has the contract to complete the road to Alexandria and for the extension north, is distributing ties between the end of track and Alexandria. The grading on the uncompleted section south of the latter town will be finished by May 1, and a large part of the tracklaying will also be finished by that time from the present terminus north of Lake Charles.

Laurel & Roaring Point.—The Delaware Legislature has passed the bill incorporating this company to build a road from Laurel, Del., to the Southern State line and to Tyaskin.

Lockhart & Catawba Falls.—The contracts for building the main line were recently awarded, and it is reported that work will soon begin on a branch five miles long to Fort Lawn, S. C., where a connection will be made with the Richmond & Danville.

Macon & Atlantic.—The contractors have finished about three-fourths of the grading between Macon, Ga., and the terminus on the Atlantic coast at Colleton, S. C., a point on Port Royal Harbor, a few miles north of Savannah. There is considerable trestling on the line, but five-sixths of all this work has been finished. The track is now being laid from Bruton, on the Atlantic coast, and about 12 miles has been laid south. The grading averages about 25,000 yards per mile. The road is being built with one per cent. grades and four degree curves and 70-lb. rails are used. The total length of the extension is 180 miles. The company owns five miles of water front at Colleton, and it is proposed to expend nearly one million dollars in building a town and in other improvements at that point.

Macon Terminal.—This company is being organized at Macon, Ga., to build a belt line around that city from the station of the East Tennessee, Virginia & Georgia through the lower part of the city to the tracks of the Southwestern. It will be about three miles long, and the cost of its construction is estimated at $45,000.

Mason City & Fort Dodge.—The directors voted to extend the road from Fort Dodge and Lehigh, Ia., to Council Bluffs, at a meeting in Fort Dodge, Feb. 19. It is understood that the negotiations at one time pending between this company and the Winona & Southwestern for a consolidation have been broken off by the latter company, which claims that it would be more economical to build a new line between Mason City and Fort Dodge than to accede to the demands of the road.

Mexican Southern.—Read & Campbell, the contractors for the line from Tehuacan to Tecomavaca, which is a little over 60 miles long, have the track laid for 30 miles to a point near Venta Salada. The road will probably be finished as far as Tecomavaca by the 1st of April, and it will be opened for operation some time that month. The most difficult work on this section is in the Cues Canyon, extending for about 15 miles north of Tecomavaca. There are three tunnels on this section, 160, 80 and 60 meters long each. The iron bridges rest on abutments and piers of solid masonry, the road bed is ballasted with 2 ft. of broken stone, and steel crossties are used. The contractors will soon begin work from Tecomava, south to Oaxaco, 90 miles. The bridge work will be heavy and will include four 50-metre spans, two 40 metre spans, four 30-metre spans and one of 25. The others have spans of 20 metres, 15 metres, 10 metres, 7 metres, etc., and the total number of iron bridges is 175. Just south of Tecomavaca the Salada river will be crossed by a bridge having two clear spans of 50 metres each, and the Rio Grande a few miles further south will be crossed by a similar bridge. For their work on this line Read & Campbell receive six per cent. mortgage debenture bonds to the amount of £600,000; preference shares, £500,000, and ordinary shares, £500,000.

Monterey & Mexican Gulf.—The line has been opened to La Panocha, about 60 miles east of Victoria, Mex., and the construction materials have arrived for continuing work on the balance of the line to Tampico. The total length of road now in operation is about 300 miles, from Geronimo Trevino (Vanadito) southeast to La Panocha, the present terminus. The road will probably reach Tampico in April.

Montgomery, Tuscaloosa & Memphis.—It is reported that negotiations were closed in New York last week for placing $500,000 of the first mortgage bonds of the road, and that Dean, Berry, Boehmer & Co., and their sub-contractors, are preparing to resume the work on the extension north of the Montgomery River suspended some time ago.

New Roads.—A bill is before the Massachusetts Legislature to incorporate a company which proposes to build a road from Marshfield northwest to Weymouth, Mass., on a more direct line than that of the Old Colony road between the two points. The two towns connected are given power by the bill to subscribe to the capital stock of the company, and if the road is built it will be through the funds subscribed in this manner.

The sum of $9,000 has been appropriated by the Legislature of Alabama to make a survey for a proposed road from Florence, Ala., through the western part of the state via Tuscaloosa to Mobile. John T. Milner, R. T. Simpson and Ex-Gov. Seay are the commissioners.

Jacob M. Pearce, Jarrettsville, Md., is interested in a proposed road from Jarrettsville to Spark's Station, on the Northern Central, a distance of about nine miles.

Frank Hearne, C. D. Hubbard, Wheeling, W. Va., and others are reported to be securing means to build a proposed competing line from Wheeling to the coke region at Connellsville, Pa.

A road is projected to extend from Painesville, O., or one of the harbors on Lake Erie, in that vicinity along the Grand River for several miles, and thence to a connection with the New York, Pennsylvania & Ohio at Phalanx. The line will be about 50 miles long, and it is claimed that it will shorten the distance from Pittsburgh and Wheeling about 30 miles.

North Carolina Roads.—Bills to incorporate the Mt. Olive Railway & Lumber Co., Hot Springs, Webster & Savannah, Western & Southern, and a company to build from Concord to Monroe have passed the North Carolina Legislature.

Ohio River.—The extension of this road, recently authorized by the board of directors, is to begin at Guyandotte, W. Va. A bridge will be built across the Guyandotte River at that point and also over Twelve Pole Creek. From Guyandotte the line will be built to Tenth street, in Huntington, and thence over the right of way of the Huntington and Big Sandy to Kanova, where connection will be made with the Norfolk & Western. The grading between Huntington and Kanova was completed last year by the Huntington & Big Sandy, a branch of the Ohio River road.

Oxford & Coast Line.—H. C. Herndon, R. R. Roberts, H. R. Scott and others have applied to the North Carolina legislature for a charter for this company to build a line from Oxford to either Springhope or Nashville, N. C.

Paducah, Tennessee & Alabama.—The track has reached Paris, Tenn., 65 miles south of Paducah, Ky., and the first train to run over the entire road from the Kentucky River south reached the southern terminus Feb. 21. Regular trains will be put on immediately between Paducah and Paris.

Philadelphia & Reading.—The work on the stations, side tracks, and similar work has delayed the regular opening of the extension of the Northeast Pennsylvania from Hartsville to New Hope, Pa., but daily passenger trains will be put on before March 20.

Philadelphia, Wilmington & Baltimore.—The second track of the Delaware road between Clayton and Dover, Del., will be completed shortly. The distance is 11 miles, and when it is finished the road will be double tracked from Wilmington south for 48 miles. This will leave 50 miles to finish the double tracking as far as the connection with the New York, Philadelphia & Norfolk.

Pittsburgh, Shenango & Lake Erie.—The committee of the common council of Erie, Pa., has agreed to grant this company free right of way through the streets of the town for its extension to Lake Erie. The city is to be indemnified from judgments in damage suits. The Pennsylvania will probably enjoin the building of the line, as it claims a prior franchise over the route.

Port Edwards, Centralia & Northern.—The first train operated under a regular schedule was run last week from Port Edwards north through Grand Rapids, Vesper and Centralia to Marshfield, Wis., on the Wisconsin Central. The length of the line is about 30 miles, and it extends through an extensive lumber country.

Rainy Lake, Crookston & Pacific.—The company has filed articles of incorporation with the secretary of state in Minnesota. The capital stock of the company is $10,000. The road is to begin at Rainy Lake and extend to a connection with the Northern Pacific in North Dakota. The officers are: Halver Steenerson, President; C. E. Sawyer and J. R. McKennon, Vice-Presidents; O. H. Tucker, Secretary; L. Ellington, Treasurer, and Elias Steenerson, General Manager.

Rockaway Valley.—Work has been recently resumed on the Mendham extension from Peapack easterly to Mendham, N. J., a distance of about six miles. It will be necessary to erect a trestle 400 ft. long and 30 ft. high at Peapack. As soon as this has been completed the company will begin the tracklaying, which it is expected will be about April 1. Nearly all the grading on the extension was finished last year and it is expected to have the line opened for traffic by May 30.

Rome, Watertown & Ogdensburg.—The company last week filed a map of a proposed branch through Watertown, N. Y., on the north side of the Mohawk River, its present line being on the south most of the way.

St. Louis & Southwestern.—A new survey was begun last week for a proposed extension from the present terminus at Delta northerly along the Mississippi River levee into St. Louis, Mo. It is understood that the company proposes to build a station in that city at Third street and Chrystie avenue. The extension is over 100 miles long, and a survey was made in 1889 at the time that the extension to Delta was built. Work was abandoned when the road went into the receiver's hands, but it is reported that the contract will be let shortly for grading the extension toward St. Louis. The present surveys are being made at a distance of from one to four miles from the Mississippi River. Robert Moore is Chief Engineer.

St. Paul, New Ulm & Southwestern.—A bill has passed the Minnesota Legislature authorizing the city of New Ulm to issue $24,000 bonds in aid of this work.

Seneca County.—This company was incorporated in New York last week with a capital stock of $100,000. It is proposed to construct a road from a point about 1½ miles east of Geneva, on the Lehigh Valley, to Seneca Falls, a distance of 10 miles.

Southern Maryland.—It is reported that the contractors have agreed to complete the grading on the southern extension from Mechaniesville toward Point Lookout, Md., a distance of 48 miles, by next fall. Some of the work has already been done by the New York Improvement Co. The proposed extension from Branlywine north to Washington, D. C., will also probably be begun this year.

Staunton Belt.—Codwise & Allen, Baltimore, Md., have been awarded the contract to build the belt road at Staunton, Va., two miles long, for the Staunton Development Co.

Texarkana & Fort Smith.—A short extension of the track is being laid through Texarkana, Tex., to Front street, in that town. It is proposed to begin work very soon on the proposed extension from Red River north through Sevier and Polk counties in Arkansas.

Toledo, Ann Arbor & Mackinaw.—The articles of incorporation of this company were filed in Michigan last week. It is to build a road from Marion to Mackinaw, Mich. The line will be an extension of the Toledo Ann Arbor & North Michigan.

West Virginia & Pittsburgh.—About 100 men have begun working on the last section of the extension from Shaversville, W. Va., to the Williams River, for which the contracts were let last week. The extension is 37 miles long.

Wilmington & Southern.—A bill to incorporate this company has passed the North Carolina legislature. The road extends from Wilmington south to Southport.

Yadkin.—Several hundred men are reported at work on the grading of the extension from Bilesville southeast through Albemarle to Norwood, N. C., a distance of about 40 miles from Salisbury, the northern terminus of the line. It was completed to Bilesville, 24 miles, last year, and it is expected that it will be in operation to Norwood early in March. The line is a branch of the Richmond & Danville.

Zanesville Terminal.—The Columbus, Shawnee & Hocking, which is building this line to Zanesville, O., has been delayed in completing the road by injunctions secured by property owners, who have refused to grant the right of way. In an attempt to avoid further complication, and to escape additional injunctions, the track was laid across the property in dispute one night last week.

GENERAL RAILROAD NEWS.

Chicago & Erie.—Judge Gresham, in the Federal Circuit Court at Indianapolis on Feb. 19, approved and affirmed Receiver Volney T. Malott's report of the Chicago & Atlantic road. The receiver was discharged and ordered to pay to the reorganized company a cash balance on hand of $28,719, and the latter road assumes all outstanding debts of the former.

Dubuque & Sioux City.—The Illinois Central has recently effected a new lease of this road. The lessee agrees to pay as rent the net earnings of the property, but assumes none of the debts or other liabilities of the lessor, and reserves the right to terminate the contract on two months' notice. The Illinois Central owns substantially all of the stock of the leased road.

Escanaba, Iron Mountain & Western.—This road, which was built in Northern Michigan last year from Iron Mountain to Escanaba, 33 miles, by the Schlesinger syndicate, has been sold by them, but the name of the purchaser is not made public. It is understood that the purchase was made in the interest of the Chicago & Northwestern.

Georgia Southern & Florida.—The three roads controlled by the Macon Construction Co., the Georgia Southern & Florida, Macon & Atlantic, and Macon & Birmingham, have been purchased by the Seaboard & Roanoke system, that company having secured the majority of the capital stock of each company, held by the Macon Construction Co., the contractors. One account says that the lessees guarantee six per cent. on $2,000,000 of the common stock, which is to be increased to seven per cent. when its gross earnings reach $1,000,000 a year. A new road will be built from a point near Elberton to Macon, Ga. Another account says that the terms are for the first year, two and one-half per cent. upon the stock; second year, three per cent.; third, three and one-half per cent.; fourth, four per cent.; fifth and all subsequent years, five per cent.

Herkimer, Newport & Poland.—The New York Central & Hudson River road has purchased this line, and will reorganize and extend it north from Poland to Boonville, N. Y., about 25 miles. At Boonville a connection will be made with the St. Lawrence River extension of the Central, the Mohawk & St. Lawrence, which will continue the extension to Clayton, paralleling the Rome, Watertown & Ogdensburg. The Herkimer Road extends from Herkimer to Poland, N. Y., about 16 miles. The name of the road will probably be changed to the Mohawk & Northern.

Lakeside & Marblehead.—William Kelly, of Port Clinton, O., was appointed receiver of this road by the court at Sandusky last week on petition of several stockholders, who claim that many irregularities have been permitted in the financial management of the road, and that the earnings of the line have been diverted from the stockholders for the benefit of certain of the directors.

Northern Central.—The annual report was issued last week. The gross earnings were $6,698,797, an increase of $538,840, and the net earnings were $1,687,038, a decrease of $257,318. The passenger business increased 9 per cent. and the freight 14 per cent. Because of a heavy increase of the operating expenses, due to the cost of handling a largely increased business, the amount available for dividends was only $583,722, or about 7½ per cent. on the capital stock. The directors declared 7, and carried forward a surplus. The company issued $368,150 of new stock and sold $100,000 of 4½ per cent. bonds to raise funds for the erection of two grain elevators at Baltimore.

Pennsylvania.—The statement of the business of all the lines east of Pittsburgh and Erie for January, as compared with the same month in 1890, shows an increase in gross earnings of $170,164, an increase in expenses of $28,991, and an increase in net earnings of $141,173. All lines west of Pittsburgh and Erie show for January, as compared with the same month in 1890, a decrease in gross earnings of $87,918, a decrease in expenses of $87,811, and a decrease in net earnings of $107.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Feb. 25, 1891.

The Board of Commissioners of the Western Traffic Association have issued a circular giving rules for proceedings before them. Propositions for changes in rates are to take the usual course in the respective associations and then be submitted to the officers of the Western Traffic Association lines having jurisdiction under the by-laws for approval or disapproval. If approved, they are then to go before the Board of Commissioners for a majority approval. The initiative vote in the Rate Committee must be unanimous to carry the proposition before the members. All subjects regularly entertained at any meeting of the Western Freight, Western Passenger, Trans-Missouri, Southwestern Railway & Steamship, and Trans-Continental Associations are to be regarded as pending under the by-laws of the Western Traffic Association. If a proposition fails to receive the unanimous vote of the Rate Committee or of the competent officers of individual roads, it may be considered as presenting a difference under the by-laws and the designated officer of the line making the application may present it to the Board of Commissioners for hearing and decision. In case the commissioners cannot unanimously agree within 21 days, the matter may be appealed to the Advisory Board for determination. Provision is made for hearings by the Board of Commissioners upon applications for the adoption of measures "designed to secure uniform, stable and reasonable rates and to prevent unjust discrimination, and to enable each line to carry its fair share of competitive traffic," and also for relief to meet the competition of outside lines. The Board construes the by-laws as authorizing it to proceed upon its own motion in these respects. In regard to the apportionment of traffic, applications in writing are to be addressed to the chairman; a hearing will be had, and, "if deemed advisable, such lawful arrangement for an equitable division of traffic in competition will be made as the commissioners, after investigation, may announce." In regard to the relation of the Western Traffic Association to other existing associations, the Board adopted the following resolution:

Resolved, That it is the sense of the Board of Commissioners that all meetings of the Western Freight Association, the Western Passenger Association, the Southwestern Railway & Steamship Association, the Trans-Missouri Association and the Trans-Continental Association, respectively, be held as meetings of said associations, subject only to the rules of the one of said associations holding such meeting; but with the understanding that all members of the same, who are also members of the Western Traffic Association, are in duty bound not to take any action in violation of the obligations thereby assumed, and that all action taken in any and all of said associations on any proposition submitted by a representation of a company which is a member of the Western Traffic Association should be treated by the members of the Western Traffic Association as subject to its by-laws and to the rules adopted and published by the Board of Commissioners thereof, it being understood that such action shall be considered as the action of the proper Rate Committee of the Western Traffic Association.

In case action shall be taken in any of the said five associations, occasioned by members thereof who are not members of the Western Traffic Association, which would be contrary to the agreement, by-laws or rules of same, and which has the effect of reducing rates in any of its territory, the commissioner of the proper division of said Western Traffic Association shall authorize the members of said association to meet such rates as being established by the competition of outside lines.

Another meeting of the General Managers of the St. Louis roads was held Feb. 21 to again consider the action of the Jacksonville Southeastern in respect to passenger rates. President Manvel, of the Atchison, was present, and assured the lines of his co-operation in the matter, and stated that it was his intention to have the agreed tariff maintained by his southern connection. At his request the date upon which the tickets of the Jacksonville line were to be boycotted was postponed until March 3. The disturbance occasioned by the Atchison's alliance with the Jacksonville & Southeastern will probably now soon be at an end, as the latter road to-day made formal application to Chairman Finley for admission to membership in the Western Passenger Association. This action was undoubtedly through the influence of the Atchison.

A reduction in flour rates to the basis of 10 cents per 100 pounds from St. Paul and Minneapolis to Chicago will go into effect to-morrow. This is to meet the competition of the "Soo," which reduced last week the rate on flour 2½ cents to seaboard points. The Chicago lines will request a conference with the "Soo" officials, in the hope of bringing about an agreement to restore the rates to their former basis.

The East-bound Passenger Committee of the Central Traffic Association met to-day, and renewed for a period of five years the agreement to allow tickets to be placed on sale in hotel ticket offices. The first agreement was for one year and will expire March 11.

The Western Freight Association roads have agreed to pay no commissions to any freight line after March 13.

The Burlington, Cedar Rapids & Northern will appeal the joint rate case, which was decided adversely to the road, to the United States Supreme Court.

The Commissioners of the Western Traffic Association have announced their decision in regard to an application to reinstate the divisions upon traffic interchanged with the Union Pacific at Omaha and Council Bluffs in use prior to Nov. 1, 1889. These are the divisons which were in effect prior to the formation of the Union Pacific Northwestern contract. The Board rules as follows:

"This application is made upon the ground that the same are the only duly established divisions under existing associations, the change made at that date not having been authorized, and that Article XII. of the by-laws requires their recognition and enforcement. . . . The Board does not feel authorized to entertain questions in respect to the legality, under the rules of the existing associations, of rates or divisions which were in force on Jan 31, 1891, upon the lines of all members of the Western Traffic Association that were interested in the traffic in question, being then uniform and the same upon all such lines."

A decision was also made in respect to the failure of the Iowa Central to put in effect certain rates promulgated by the Western Freight Association, also in reducing rates on sugar, molasses, coffee and dried fruits from Chicago to Oskaloosa and Marshalltown. The Iowa Central claims that its action was authorized under the rules of the Western Freight Association, while the Chairman of that Association and other members claim the contrary. The decision says:

"While by no means admitting the claim of the Iowa Central to be correct, the Board are largely governed in the conclusion which they have reached by the belief that the preservation of the existing improved rate adjustment throughout the western territory generally demands that the rates of that line shall conform to the rates established by other lines in accordance with the official proceedings of said association. The commissioners are required to adopt such measures as will tend to secure uniform, stable and reasonable rates, prevent unjust discrimination and enable each line to carry its fair share of the competitive traffic. In consideration of the general rate situation and of the importance of preserving the adjustment which has been agreed upon by all lines, including the Iowa Central, and is now generally effective throughout the West, the successful maintenance of which is seriously endangered by the action of the Iowa Central in the matter referred to, it seems to the Board necessary that the Iowa Central, as soon as the same can legally be done, should put in effect the Mississippi River rates promulgated by the chairman, and should also, as soon as the same can legally be done, restore its tariff from Chicago to the figures in effect prior to the reduction made under its notice, and it is so ordered. In thus disposing of the matter the Board desire it to be understood that prompt compliance with this order will not debar the Iowa Central or any other interested line from presenting in due form the question of the rate adjustments referred to for further consideration upon the merits thereof."

Traffic Notes.

A Car Service Association has been established at Charleston, S. C., including in its membership the Northeastern, the South Carolina, the Charleston & Savannah and the Cumberland Gap roads. Legare J. Walker is its Manager. Mr. Walker was at one time Railroad Commissioner of South Carolina.

The Interstate Commerce Commission has published an opinion, prepared some time ago by Commissioner Schoonmaker, in which is announced the decision in the case of the Kauffmann Milling Company, of St. Louis, against the Missouri Pacific and 19 other roads. The rate on flour from points in Missouri and Kansas to points in Texas is five cents higher than the rate on wheat. The Commission decides that under the conditions existing in this territory a rate of five cents less on wheat than on flour is not unlawful, but that a differential exceeding five cents works unjust discrimination and is unlawful.

The Nashville, Chattanooga & St. Louis wants to raise the passenger rates on the Western & Atlantic to three cents a mile. Some time ago, it will be remembered, the Western & Atlantic was given permission to reduce fares from 3 cents a mile to 2½ cents on through tickets and 2½ cents and 2¾ cents on lesser distances. This permission was granted by the railroad commission, as no road has the right to make changes in its freight or passenger rates without the permission of the commission. Now the Nashville, Chattanooga & St. Louis desires to be given permission to return to the 3-cent rate, claiming that the road ought to be on a plane with the other roads of the state, and that it cannot be successfully operated with the passenger rates prevailing.

New York Railroad Club.

A regular meeting of the New York Railroad Club was held at its rooms, Gilsey House, New York City, Feb. 19. About 60 members and guests were present. Papers were read on "The Best Diameter of Car Wheels," by Mr. Samuel Porcher, and "Recent Improvements in Car Wheel Construction," by Mr. P. H. Griffin. Mr. Porcher's paper appears in another column. That by Mr. Griffin is held for the author's revision.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Feb. 21, amounted to 78,681 tons, against 71,490 tons during the preceding week, an increase of 7,191 tons. The proportions carried by each road were:

	Wk. to Feb. 21.		Wk. to Feb. 14.	
	Tons.	P. C.	Tons.	P. C.
Michigan Central	12,106	15.4	10,439	14.6
Wabash	4,010	5.1	4,113	5.8
Lake Shore & Michigan South.	12,848	16.4	11,202	15.7
Pitts., Ft. Wayne & Chicago	7,416	9.3	7,898	11.0
Chicago, St. Louis & Pitts	10,091	12.9	7,861	11.0
Baltimore & Ohio	4,549	5.8	4,578	6.4
Chicago & Grand Trunk	11,562	14.7	3,791	13.7
New York, Chic. & St. Louis	8,906	11.4	9,031	12.6
Chicago & Atlantic	7,193	9.0	6,577	9.2
Total	78,687	100.0	71,490	100.0

Of the above shipments 4,924 tons were flour, 39,904 tons grain, 3,404 tons millstuffs, 6,423 tons cured meats, 3,413 tons lard, 7,629 tons dressed beef, 1,048 tons hides, and 6,994 tons lumber. The three Vanderbilt lines carried together 43.2 per cent., while the two Pennsylvania lines carried but 22.2 per cent.